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SOME PROBLEMS OF THE FUNCTIONAL PSYCHOSES.*

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Dr. Thomas W. Salmon once charmed an audience with an entertaining allegory in which he described how Psychiatry, in the rôle of Cinderella, was treated rather harshly in the Home of the Medical Sciences, and saw with some envy the more favored conditions of her step-sisters Medicine and Surgery. At last Cinderella was invited to the ball and won the approval of the Prince, representing public opinion.

A psychiatrist giving a Pasteur lecture before the Institute of Medicine of Chicago can sympathize with the timidity of Cinderella in entering the social arena in comparison with others of more recognized status.

The list of former Pasteur lectures is somewhat disconcerting. It enumerates a series of communications on very specific topics dealt with by the most precise methods under strictly controlled conditions. The communications are, to a large extent, based upon material obtained by the experimental method. Each lecturer has been able to start from a certain common ground of chemical and physiological doctrine, familiar to his audience. It is different with Cinderella, who is somewhat abashed to find that the language she speaks is not easily understood, and that the topics which interest her are not in the scientific fashion. She feels tempted to give up her naive human interests, and deck herself in more fashionable garb.

Recent advances in our knowledge of infectious and endocrine disorders and of such diseases as diabetes, rickets, pellagra, perni-

*The Pasteur Lecture delivered before the Institute of Medicine of Chicago, November 18, 1927.

cious anæmia show the great gain from intensive research into the fundamental life processes. These dramatic advances have done much to foster the tacit assumption that in all disorders fundamental work must be along similar lines; work along other lines is looked upon with some suspicion and may even be denied the title "scientific." This is a severe penalty, for to many the term "science" has the same reassuring magical significance as the term Mesopotamia which the old lady requested the minister to put as an ingredient in his prayers.

The prevailing trend of medical work has had its influence on the study of mental disorders and there is available a considerable body of observations on the fundamental biological processes of patients suffering from a variety of mental disorders. The presentation of this material might have appeared to continue the tradition of these lectures. The Pasteur lecture of 1923 was given by Dr. Otto Folin on "What we have learned about uric acid," and reminds us of his earlier studies in the field of mental disorders when for several years (1900 to 1904) at the McLean Hospital he studied intensively the metabolism of mental patients. The special gain from his work was the elaboration of certain quantitative methods, and the establishment of exact figures for the composition of the urine. So far as our understanding of the functional psychoses is concerned his research yielded a negative result:

> From a destructive, negative or critical point of view, it is believed that the data given prove the untrustworthiness of all those metabolism experiments, old and new, which report a "characteristic" increase or "diminution" of any of the urinary constituents included in this research (*i. e.*, volume of urine, total nitrogen, urea, ammonia, uric acid, kreatinin, organic bases, total sulphates, ethereal sulphates, "neutral sulphur," phosphates, chlorides, organic or mineral acids, indican) as associated with any particular one of the ordinary mental disorders. It is not claimed that such characteristic abnormal metabolism may not exist, but simply that the experiments recorded in the literature are insufficient to demonstrate the fact.

The conclusion of Dr. Folin still holds good, and no subsequent work dealing with the urinary constituents has thrown any special light on the functional psychoses, neither on the variations of mood so characteristic of the benign group, nor on the odd behavior and beliefs so suggestive of a more serious outcome.

To some it seems disappointing that refinement of chemical method should not have revealed the key to the structure of the psychoses, while others are less surprised to note that the details of man's struggle with his destiny are not necessarily reflected in his urine. The relation between an individual's philosophy of life and the constitution of his urine is to a certain extent the topic of this lecture, and one may anticipate the general conclusion by saying that it is dangerous to neglect the study of either of the two factors. The individual's philosophy is a condensed expression of an infinitely complicated series of reactions to his total environment; the urinary output is an indication of the efficiency of certain essential but more limited functions. The examination of the waste from the ship's furnaces will not indicate the course that is steered nor the nature of the cargo, but it may be the condition of the fuel supply which finally determines the harbor reached and the amount of the cargo salvaged.

As the psychiatrist in his humility turned to the chemist to borrow methods and to ask for the solution of his problems, so when endocrinology made her triumphant appearance and seemed to offer a formula for each man's physique and character, the psychiatrist paid homage at her shrine, focused his attention on the relevant data, eagerly accepted dubious tests, studied the pathological anatomy of the ductless glands and translated his old observations into a new language.

The Pasteur lecture of 1925 by Professor Abel must have shown how critical one requires to be in this field, even when working under the strictly controlled conditions of the laboratory, and studying the simple life processes of experimental animals. How much more critical must one be when one is dealing with the conditions of the clinic, and studying the reactions of the human being to his complex social environment!

If the study of mental disorders has been seriously influenced by the contributions of bio-chemistry and physiology to general medicine, it has also been responsive to the claims of bacteriology, and some psychiatrists follow eagerly Pasteur's motto "seek the microbe" even in territory where he himself might have felt it wiser to hunt a different quarry.

In this period of restless medical investigation, with intoxicating discoveries and new vistas rapidly opening up, the psychiatrist in face of the problems of the functional psychoses, while welcoming and assimilating the new methods and results, must be on his guard against being seduced by borrowed formulations, which are inadequate to the real complexity of his special subject.

I have mentioned the functional psychoses, the special topic of this lecture. The term is not free from objection, it may seem to beg the question. This is not so important for what I really wish to discuss is not the functional psychoses, not certain bloodless abstractions, but a great group of sick men and women, including not only those who, to the number of thirty thousand annually, enter the mental hospitals of the United States on account of the severity of their disorder, but those who remain under the care of physicians outside of hospitals. In these patients the symptoms do not seem to be the expression of organic disease of the brain nor of any unequivocal toxic or infectious disorder; they seem to spring from some more obscure source and the apparent mystery of their origin has contributed to the emotion of the ordinary man and to the fatalistic attitude of the medical profession in face of insanity.

I should like this audience not to think in terms of insanity, nor in terms of functional psychoses, but in terms of these sick men and women, distressed by painful emotions, haunted by past memories and repressed cravings, striving by means of their complex mental endowment to mould their experience into a tolerable and satisfying form. It may seem prudish not to use certain familiar diagnostic terms in discussing these patients. I have a great fear of these terms; I have seen their malignant results; I have seen patients crushed by them; I have seen the thought of physicians paralyzed by them; I hesitate to contaminate your thought. If you ask me the reason why I do not supply you with a purified and appropriate series of terms which would do justice to the actual complexity of the clinical material, I can only give the plain answer which Johnson gave to the lady who asked him why he had defined the pastern as the knee of a horse: "Sheer ignorance, madam."

The patients referred to are liable to present disturbances of mood, depression, fear, apathy, exhilaration, perplexity; their

behavior may be exuberant, unbridled, queer, impulsive, aggressive; the world of the patient's experience may contain voices and visions, magical influence, hostile forces, social antagonisms, cosmic and divine interferences.

It is obviously reasonable in a case of sickness, no matter what the clinical picture may be, to review the simple mechanisms before studying the more complex. The influence of the physiological functions on the higher functions of behavior and thought is familiar; a hungry man is an angry man; a constipated man may be a depressed man; an apical abscess with ensuing sleeplessness may throw some light on a jealous and suspicious husband; change of mood, impairment of memory, odd social reactions may be the first indication of a brain tumor, an encephalitis, an infectious disorder.

The development of new methods has enabled the psychiatrist to make a much more intensive bio-chemical and physiological study of his patient with disturbed mood, odd behavior, and distorted ideas. Haunted by the possibility of the mental disorder being merely symptomatic of some recondite physiological disturbance—a possibility which may well apply to a considerable group of cases—he has scrutinized the urine, the blood, the cerebro-spinal fluid. He has studied in the blood among other points the coagulation time and the platelet count, the calcium and phosphorus content, the sugar curve. He has examined the cerebro-spinal fluid and studied the permeability of the meninges. He has felt the importance of the autonomic nervous system, has consulted it by means of pharmacodynamic tests, has spent time over the oculo-cardiac reflex, has studied the secretory and motor activity of the gastro-intestinal tract; he has speculated over the rôle of the endocrine glands, has incriminated the gonads, cast suspicion on the thyroid and the pituitary, and utilized what tests of functional efficiency were available. He has considered the claim that the functional psychoses are merely the expression of some underlying focal infection. The data of pathological anatomy have been carefully scrutinized and it has been necessary to evaluate statements as to the defective anatomical endowment of the individual, the evidence of disease in endocrine glands and other structures, and the real significance of the changes in the cerebral cortex, every layer of which has its supporter or group of supporters for its claim to honorable mention.

All this honest work at the physiological level has failed to make the functional psychoses more transparent, and Kraepelin himself in reviewing the more ominous group could only hope for new light to be thrown on these problems from some unexpected quarter.

In such an impasse it is well to return to the main stream; to come down from the abstractions of disease-processes to the solid ground of human experience may help us like Antæus to grapple more successfully with our problems. The studies at the physiological level have been abstract studies; they have dealt with the individual separated from his environment, they have dealt with him as a laboratory animal. The environmental and personal factors which have been provisionally eliminated in order to get the polished formulæ of bio-chemistry or physiology, may after all be found to contain the vitamines which are the very essence of the situation.

Our problem is not a problem of the functional psychoses, I repeat, but a problem of human life; it is not a problem of human life in general, but it is a problem of individual human lives each in its own individual setting. We have to deal with the behavior, the mood, the experiences and beliefs of individual men and women and again we return to the question whether the individual modification of these experiences can ever be adequately dealt with in terms of physiology or chemistry. As the views of different workers are to a large extent based upon their attitude to this underlying philosophical problem it may be as well to face the issue here, in order to justify our dealing later with the details of man's adjustment to his environment.

It is a common attitude to consider that explanation consists in resolving a fact into "the preceding set of facts out of which it arose" (Leslie Stephen), no matter whether the preceding set of facts are of the same order of complexity as the fact to be explained or not. Thus many are willing to resolve man's ideals into primitive tendencies, these primitive tendencies into biological components, these later again into chemical and physical elements; in such a scheme the relation between a man's philosophy and the urinary constituents must needs be a very close one. It would be out of place to elaborate the criticism of this naive scheme of existence. One may mention Huxley's Romanes Lecture on Evolution and

Ethics (1893) in which he vigorously protests against explaining human ethical progress on the basis of the "cosmic process" of evolution. One may refer to the elaboration of Huxley's thesis by a Scotch philosopher, A. Seth Pringle-Pattison, in an essay on Man's Place in the Cosmos in which he discusses the nature of scientific explanation and emphasizes the principle that "the true nature of the cause only becomes apparent in the effect." In other words if there is some causal relationship between the urinary constituents and the philosophy of the individual, we shall have to do fuller justice to these constituents than is the custom of the chemist.

Additional support for this point of view is furnished by the biologists who find that they cannot do justice to the facts of observation if they are bound in the rigid frame of the mechanistic evolution of a universe which consists in "*nothing but* a set of one or a few kinds of particles moving according to a few immutable laws exemplified at any time and anywhere that particles occur" (Jennings).

The laws of each science have to be studied at the level of that science; at different levels new types of action appear, not hitherto exemplified. According to this doctrine of Emergent Evolution "new things and new modes of action distinguish the living from the non-living, the sentient from the non-sentient, the reasoning from the non-reasoning, the social from the solitary" (Jennings). This position is supplemented by the physiologist when he states that by studying the individual functions of the body "we can discover how each organ or tissue plays its part in life as a whole; but if we leave out of account life as a whole because this consideration savors of teleology, we reach nothing but an unintelligible jumble of unconnected observations" (J. S. Haldane).

With the authority of biologists and philosophers, therefore, we may go gaily on our way and continue to take a keen interest in the specifically human reactions of our patients. It appears to be quite sound scientific method, when dealing with a mental patient, to go beyond the intensive study at the chemical, physiological, bacteriological level and to analyze carefully the personality of the patient and the behavior in relation to the specific environment. From Pasteur himself one might learn to pay careful attention to the whole situation as well as scrupulous accuracy of observation

and the importance of the experimental method. Whether his problem dealt with racemic acid, the diseases of silk worms, the manufacture of wine or beer, the contagion of anthrax, we find Pasteur making a careful survey of the total situation, condescending to examine the vats of brewers, the frames of silk worms, the feeding habits of sheep. Had our present problem occupied his attention, I do not believe that he would have limited his study to the patient as an isolated unit but rather think that he would have insisted on a systematic investigation of the environment and of the interplay between the moulding influences of the environment and the responsive personality of the individual; I do not think that he would have indorsed the attitude of a distinguished modern representative who looks upon such studies of the environment as an *extra-medical* investigation.

One further point may be taken up in regard to the investigation of the functional psychoses, viz., the fact that here the experimental method plays such a limited rôle. As to the demand for experimental evidence, the psychiatrist is at a disadvantage in comparison with his colleagues. In relation to many problems the processes in the laboratory animal and in man are sufficiently similar for the experimental method to yield valuable results; metabolic, endocrine and immunologic problems have thereby received important help.

In regard to human behavior and thought it is possible to do experimental work so long as the experimental procedure is a trifling interference and does not seriously modify the personality nor the situation of the patient nor leave disturbing memories; thus one may experiment on the result of fatigue, of drugs, of distraction, etc.

In the field of the functional psychoses one is dealing with the reaction of the individual to important issues in life, to bereavement, to thwarted ambition, to disturbing domestic situations, to the demands of the sex instinct. In regard to such topics any experimental procedure would be an intolerable interference with the life of the individual, and no procedure can be attempted which is not of a meliorative type.

Nature, however, has no such hesitation about experimenting, about compounding the constituent elements of the individual in a disconcerting way, about exposing the child to a variety of dis-

torting influences, about producing every sort of mating combination, about facing the adult with sterility, seduction, bereavement, social and professional failure. The psychiatric wards of a hospital have to be looked on as an experimental laboratory of psychology where the results of important experiments of nature can be accurately studied, although the physician may have had no responsibility for determining the conditions of the individual experiment.

The above considerations of method and of interpretation have been somewhat lengthy. Let us look at the actual stuff with which we have to deal.

(1) A girl of 19, brought up in a poor, depressing and quarrelsome home atmosphere, was sensitive to the limitations of the home, had high ideals and ambitions.

She developed an acute excitement, talked volubly, showed playful overactivity. God had given her the keys of the United States treasury, she was the spring of universal peace, the gates of Heaven were wide open to her; she was sometimes ruffled when her shoulders were touched roughly (her wings as dove of peace), she talked enviously of Henry Ford (his peace ship).

The type of reaction in this case is very familiar with overactivity, overtalkativeness, distractibility, flight of ideas; but one wishes also to emphasize the individual problems of the patient and the stress of the environment.

(2) A girl of 19 became acutely excited, was talkative, elated, easily distracted; a typical benign reaction. She later claimed she heard God's voice; she became uncommunicative, and the prognosis was considered to be bad. She made an excellent recovery.

At the age of 29, after some special religious services, she became exhilarated, overtalkative, with flight of ideas; the patient talked much about sin and religious topics. She mentioned the fact that before her first attack at 19 she had been seduced, and was worrying about a possible pregnancy.

The problem in each of the above cases is to understand how that individual at that definite time developed the actual reactions which were observed; and we are far from the complete solution of the problem in any individual case.

The limits of the study of such patients at the impersonal or physiological level have been already emphasized; in these two cases such an examination threw little light on the problem.

In reviewing each individual case, in considering the personality of the patient and the difficulties of the situation there is much that is intelligible at first sight to any one interested in human nature. It seems intelligible that the ambitious girl in the sordid

and quarrelsome home should long to be the dove of peace and have the keys of the United States treasury; it seems intelligible that the young woman of 29 with her memory of a sexual lapse at 19 should ruminate over the topic of sin and over a religious solution of her human difficulties.

The preoccupations of these patients seem determined by the actual problems of their life in their individual environment. In each of the two cases briefly referred to we see a life of considerable tension, and when the patient loses normal control, repressed factors come to the surface, partly in direct, partly in indirect or symbolic form. The question arises as to whether the loss of control is due, in part at least, to the tension associated with these repressed tendencies; in our second case may the religious mission have played a definite rôle in reactivating certain disturbing tendencies and painful memories? While leaving the possibility open that the loss of control may be due to the gradual or abrupt rise in tension of repressed forces, one has to keep in mind the fact that the same type of reaction may be elicited by less personal factors, that a similar loss of control with elation and overactivity may be precipitated by a head trauma, by encephalitis, by childbirth. Clinical experience also teaches us that the patient, who at one period has a disturbance of mood of this exhilarated type, is liable at other times to show the opposite type of reaction, a morbid depression. There is also the fact of the tendency of this special type of reaction to be inherited.

It appears reasonable, therefore, to assume that this special type of reaction is a quality of the original endowment of the individual, that a certain instability of mood or liability to disturbances of mood such as depression, elation, perplexity may be a fundamental quality of the patient's personality or temperament. The individual temperament may, to a limited extent, be studied by means of a familiar pharmaco-dynamic test; under the influence of drink one man becomes exhilarated and talkative, another irritable and explosive, a third sentimental or maudlin. The constitutional quality which manifests itself in temperament also manifests itself in physical habitus and the genetic and endocrinologic aspects of this problem are of considerable interest (Kretschmer). It is not possible at present to localize this instability in any neurological or

endocrine mechanism, nor to correlate it with any bio-chemical anomaly. It may be a mistake to think of the special affective quality as localized in this or that organ, it may be a quality of every tissue and cell of the body, just as the immunity of the organism to certain organismal noxæ may be a widely diffused quality of the tissue cells.

The immunologist studies important reactions, specific and non-specific, without being able always to localize the source of the defenses nor to resolve the reactions completely into a chemical process.

So the psychologist may have to estimate in each patient the degree of his affective vulnerability, without being able to reduce this special quality to components of a lower order.

The psychoanalyst has tried to penetrate more deeply into the psychological mechanism of morbid depression; the formulations are so interwoven with the general tissue of psychoanalytic theory that their presentation would lead us rather far afield and require a review both of psychoanalytic method and theory.

In using the term affective mechanism one comes dangerously near to the old faculty psychology and does scant justice to the great complexity of the affective reactions for which our terms are so inadequate. One must remember that the affect is but one aspect of behavior in which the whole personality is involved, with its complicated conscious and subconscious structure; and the problem before us is the total sum of the individual's reactions. In the benign psychoses in which for practical purposes we are wont to emphasize the affective coloring, even the factors most closely associated with the affect may present independent problems. Elation with talkativeness and overactivity seems intelligible, but elation sometimes is found with mutism and inactivity; similarly depression may be accompanied with talkativeness and flight of ideas. Such paradoxical reactions are not made clear by an atomistic analysis into symptoms, but require much further study.

Owing to the prognostic importance of the affective element and of the symptoms that cluster round it, the other symptoms in the clinical picture are apt to be neglected. In the two young women whose cases have been reported one sees not only indications of affective vulnerability but also an attempt of the patient to deal

with disturbing personal problems by means of the creative imagination. The phantasies of the patient have a certain dramatic or poetic quality; they are presented in a fragmentary way. In such cases we may, for the purpose of discussion, refer to affective symptoms and to the special phantasies of the patient, but we have to remember that affect and phantasy are merely aspects of one integral whole, the reaction of a human individual to the special circumstances of life. The more the affective symptoms fade into the background, the more the phantasies dominate the picture, the more fragmented, symbolic, regressive the latter become the more serious the prognosis; but this ominous development can go much further than is usually supposed with complete restoration to previous efficiency still a possibility. The factors which determine that a process is non-reversible still furnish the central problem in psychiatry.

One may turn from this very imperfect sketch of the problems of the benign functional psychoses to the more serious group, to that group in which the outcome is apt to be a permanently crippled mental condition, so that many would consider the term " functional psychosis " inappropriate.

I should like again to cite cases, so that we may be dealing with living beings and not psychiatric abstractions.

(3) A pleasant young woman of 22; she talks placidly about neutral topics; smiles easily in a stereotyped way. She comes under observation as she has become afraid of her father; she has just realized that some months before he had assaulted her when asleep. She refers to the topic with little evidence of emotion, and treats it as if it were self-explanatory. There is no reason to assume that there had been any such episode as she refers to.

(4) A young man of 24, who has been brought up by his unmarried mother in almost complete isolation from his fellows; he has not been allowed to go to school, nor to take up any work. He has recently come to hear people " kidding " him, trying to get him to join their gang. They also refer to his illegitimate status. He has interpreted the marks in some library books as indicating a certain young lady's declaration of interest in him. He has come to feel confident of his own powers; he can by his thought send telegrams all over the world, he can by learning give everyone the advantage of a college education. He cheers the lonely broadcasters by answering them.

In face of such patients we are mystified. The unbridled utterances and behavior of elated patients, the absurd self-reproaches and suicidal attempts of depressed patients, may be exaggerated and

inappropriate reactions; we can at least see through the patient's eyes, we respond immediately in the light of our own experiences. Who has not felt a touch of the blues, who has not temporarily abandoned staid decorum and let himself go for a brief period?

No such immediate response meets the sinister ideas of the smiling young lady, nor the disconcerting claims of the lonely young man. The situation of these patients is much more dangerous than that of the first two patients; the clinical picture represents a much more serious disorganization of the personality. Why is the outcome in such patients liable to be so serious? Does the serious outcome, the permanently crippled mental condition of large numbers of these patients, in itself justify the assumption of some insidious impersonal disease process? So far the work of the various laboratories has not yielded convincing evidence of such disease process.

Conscientious clinical research has accumulated extensive data on symptomatology, heredity, age distribution, sex incidence, precipitating factors in these conditions and there is a mass of heterogeneous laboratory data bearing on this group of patients. It must be admitted that the attitude of the majority of psychiatrists towards these patients remains fatalistic, and one of therapeutic apathy.

In face of the meager results of the intensive study of symptoms and syndromes, of psychological and physiological and histological reactions, one does well to return to the real stuff of life, to study the actual living patient in his special environment, and to utilize what we know of the way in which real men and women react to the practical stresses and strains of life.

It is interesting to note that those psychiatrists who have studied most intensively the psychology of the individual, the influence of his past experiences, the formation of his habits and the nature of the environment, are the least inclined to talk of the unintelligibility of the clinical picture, are least fatalistic in their outlook. To them, as to others, ameliorating procedures may appear in the individual case unavailable, complicated, ponderous, tedious, but the study of the material furnishes to them much incentive for practical effort in the direction of the guidance of the child, the supervision of his habits, the amelioration of the psychological influences of

the environment, the cultivation of success at the social and economic level suitable for the individual, the utilization of his higher endowment for the weaving of a useful fabric of belief.

Instead of considering symptoms as the result of some impersonal disease, poisoning cortical areas or interfering with extrapyramidal mechanisms, one may take them up in their actual setting and consider how far such symptoms are intelligible in view of what we know of man's more complex functions and of his adaptation to the environment.

The young lady of 22 with her stereotyped smile may be more intelligible when we face the facts of the evolution of sex, realize the strength of early attachments, do justice to the important rôle of repressed factors, and make allowance for the seduction of phantasy.

So with the lonely young man of 24, artificially separated from the environment by his mother, reaching out in phantasy for the satisfaction of cravings thwarted by reality; his social cravings are represented by the gang wanting him to join them, his romantic desires express themselves in the attentions of the young lady, in his desire for power he has not hesitated to step outside the recognized order of events and to see at work again those magical influences so familiar to the thought of our ancestors.

Loss of interest hypothetically may be due to hypogonadism or dyspituitarism, but it may also result from interest and energy being withdrawn into the world of phantasy and daydreaming and autoerotism; and the indulgence in these facile, non-productive activities cannot be looked on as the expression of some simple physiological function, but as the activity of one of man's endowments which can only be formulated in psychological terms.

The fact that in such patients so little interest is available for real tasks, for social courtesies, for sympathetic understanding with others may depend upon the energy being engaged elsewhere; once the child gets its thumb into its mouth and starts sucking it, it may be impossible to get any reaction to an experimental stimulus.

The balance of interest in the real world and of that in the world of phantasy is not altogether to be formulated in terms of pituitary function, nor can it be intelligently studied without attention to the real opportunities of the life situation, and to the habit of indulgence in phantasy.

The presence of hallucinations cannot be adequately disposed of by simple reference to cortical areas and to hypothetical physiological processes in these areas. The total situation has to be considered; the general terms "voices," "visions," may do scant justice to the clinical picture; the topic dramatized, and the actual detail of the experience may be of great significance.

One may by laboratory experiment study the results of mescal button as did Weir Mitchell and later workers, one may study the less definitely controlled development of hallucinatory experiences in delirium tremens, in the auditory hallucinosis of alcoholics, in conditions of starvation and fatigue. There are many other conditions in which hallucinatory experiences develop, which can hardly be reproduced experimentally, but which yield important human documents. Under the emotional strain of bereavement many sensitive individuals have incidental hallucinatory experiences, and the lives of the saints give excellent examples of hallucinations in delicate personalities, grappling with their destiny. Our patients, too, are at grips with destiny, and in them also the hallucinatory experiences must be considered in relation to type of personality, instinctive conflicts, imaginative endowment, cultural background. Emphasis has recently been laid on the extent to which some children retain an extremely vivid visual image (eidetic imagery); to this special endowment retained in adult life some literary artists may owe their special gift of detailed and accurate description. The possibility that an endowment of this type is a determining factor in the development of hallucinations in many patients cannot be excluded. In this context one may read with profit those passages in Inquiries into Human Faculty in which Galton discusses mental imagery and visionaries; "the familiar hallucinations of the insane are to be met with far more frequently than is commonly supposed, among people moving in society and in good working health." It is partly because we pay so little attention to these phenomena in the varied settings of life that, when they occur in our patients, we study them as if they were new phenomena, alien to the familiar range of human reactions, and only to be analyzed at the physiological level. While utilizing all the light that physiology can throw on the process, it is well to keep in mind the variability of the imagery available to different indi-

viduals, the degree to which incidental factors (*e. g.*, fatigue, alcohol, fever) stimulate it, the way in which it may be fostered by the beliefs of the prevailing culture, and by its personal value to the individual (feeling of religious value, of social prestige). In the interpretation of hallucinations one must give due weight to the study of the sense organs and of the cerebral cortex, but one must not forget the star of Napoleon, the dæmon of Socrates, the angel of St. Theresa, the experiences of the spiritualists, the bereaved, the ecstatic, the poets and the artists.

The same attitude is to be recommended in the appraisal of morbid beliefs or delusions. Many of these beliefs are so much at variance with the thought of the normal person that there seems to be no bridge from them to the processes of normal adult psychology. The tendency is to look upon them as meaningless fragments caused by the brutal interposition of some impersonal process. No matter how fantastic the delusions of the patient, they prove on examination to be closely related to the fundamental cravings of human nature. In these delusions familiar human difficulties express themselves, not always in the language of adult modern thought, but frequently according to the primitive and magical idiom of our remote ancestors (Storch). The analysis of the delusions of the patient requires not only some knowledge of adult psychological processes, but a knowledge of the various stages of individual development from infancy to manhood and of the various modes of thought of man in his progress from a primitive and brutish state to that of modern culture. Beneath the orderly and logical thought of the efficient modern, modes of thought lie dormant which once expressed themselves in magical, superstitious and primitive religious belief, and under the stress of environmental strain as well as under the influence of physiological disturbances these dormant attitudes may again come to the surface.

In the estimate of the adaptive equilibrium of the patient, the delusion is important as revealing a complex of underlying forces; in formulating the case it is necessary to pass beyond the static formulation of the delusion to these underlying forces.

There has been a tendency to make the outcome a criterion of the greatest importance for the systematic grouping of the functional psychoses, and the conception of dementia præcox, with its

inevitable suggestion of a unitary disorder and a special disease process, has had a profound influence on contemporary psychiatric thought. It is difficult to avoid the seduction of such a conception and to face the possibility that this large group of psychoses may represent a very heterogeneous collection of mentally crippled individuals. In the systematic classification of physical ailments one does not group together, save for administrative purposes, orthopedic cases, nephropaths, cardiopaths and other permanently crippled cases; whether an arthritis leaves a permanent limp, or an endocarditis a permanent valvular impairment is of great practical importance, but it is not the essential element in our formulation of the underlying disorder, the streptococcal infection.

So it is vastly important from the practical standpoint whether the individual mental patient is permanently crippled or returns to his previous efficiency; the outcome of the mental disorder, however, may depend on a great variety of factors, on physiological endowment, instinctive equipment, formation of habits, early sensitization or immunization to important issues by definite experiences, on the balance between imaginative and realistic thought, on cultural environment, on the stress and strain, acute and chronic, of the life situation, on somatic ailments. It is unduly simple to assume that the unfortunate outcome is due to the evolution of some unitary disease process.

The usual outcome of a certain clinical picture may in peace time be a permanent deterioration, while the outcome of a similar condition developing in a soldier under conditions of trench warfare may often be complete recovery.

The difference in outcome is intelligible when one considers that in war time the psychosis has developed in an individual of good personality exposed to an extraordinary strain, and that it is possible by way of treatment to make a complete change in the life-situation by removal to a base hospital and security.

In peace time the clinical disorder usually presents itself without the excuse of a critical and overwhelming situation in a personality of less robust endowment, and a complete change in the life-situation is, as a rule, less easy to accomplish. It is worth noting that even under conditions of peace the transfer of a patient, who has been considered permanently crippled mentally, from one hospital

to another sometimes results in the recovery of the patient. Such facts indicate that the outcome of a case may be more than a function of a hypothetical disease-process, it may be a function of the personality of the patient and of the life-situation. Too often the life-situation is rigid and open to little modification, for many are chained to their family circle, their social environment, their economic task, their religious group.

The fact that a change is practically impossible need not blind us to the possibility that such a change might lead to recovery; in that case lack of recovery ought to be laid at the door of man's destiny, and not considered as evidence of some impersonal disease process.

SUMMARY.

A brief review of some problems of the so-called "functional" psychoses with a discussion of the psychiatric point of view in general, and of the necessity of formulating the symptoms and course of these disorders with due appreciation of the individual constitution, the cultural background, the concrete life situation.

FINGERSUCKING AND ACCESSORY MOVEMENTS IN EARLY INFANCY.

An Etiologic Study.*

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This investigation is concerned with the etiology of infantile fingersucking and certain other movements associated with it. Clinical experience with dispensary and private patients indicated the feeding method as the probable source of the difficulty. In November, 1925, several children were brought to the Mental Hygiene Clinic of the Michael Reese Dispensary because of certain infantile habits including fingersucking. Due to the psychologic importance attributed to this habit by many writers, an attempt was made to determine its relationship to other behavior problems and to the total personality. The relationship, for example, of fingersucking to the general trait of infantilism was studied. Does "spoiling" by the mother have anything to do with the habit? Are fingersucking children more likely to masturbate than other children? Do they remain more closely attached to the mother? Is their problem of social adaptation greater than normal? In May, 1926, a colored family of seven children came to the Dispensary. Each child in this family had some form of "pleasure-sucking" habit or a movement usually associated with it. In these children, as in the others who were studied, with due regard to physical, psychologic and social factors, it appeared, that in the development of the habit of fingersucking there was little or no relation to the points enumerated. In all, however, it was evident that such habits arose out of certain difficulties in the feeding act and that, in the case of fingersucking, it was due primarily to insufficient activity of the lips in sucking, aside from the question of nutrition. The records and observations leading to this view are fully cited in the case histories that follow. Certain problems relating to the move-

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ments associated with sucking habits, including the problem of masturbation, are dealt with also in comments to the appropriate cases. A statistical investigation of unselected groups is published in the latter part of the report, following the detailed case histories. Extraneous material has been omitted from case records though all ideas pertaining to the " pleasure-sucking " habit are included.

Although fingersucking or thumbsucking is an obvious " bad habit " of infancy, it requires definition because the term is often used to include a large variety of other acts. The German word " ludeln," as used by Lindner,[1] who made probably the first complete clinical study of this subject, includes all acts of " sucking for pleasure," whether of fingers, lips, tongue, any part of the body or even foreign objects. Thumbsucking is used as the equivalent of " ludeln " by some authors,[2] *i. e.*, " methodical, rhythmic but purposeless movements of the muscles of the lips and tongue." Usually the term refers to sucking merely of the designated part.

The term " thumbsucking " is often used to include " fingersucking," probably because the thumbs are sucked much oftener than the fingers. In this paper, when not otherwise specified, the term " fingersucking " includes thumbsucking. Cases of fingersucking at birth or beginning after the first year were not found in our series. The conclusions reached are limited, therefore, to sucking of thumb or other fingers (not congenital) beginning in[3, 4] the first year of life.

[1] Lindner, S. L., " Das Saugen an den Fingern, Lippen u. s. w. bei den Kindern," Jahrb. f. Kinderh, 14, 68, 1879, New Series.

[2] Abt, I. A., " Pediatrics by Various Authors," Vol. VII, p. 307, W. B. Saunders Company.

[3] As to babies born sucking their thumbs, theoretically such behavior can be explained as reflex sucking of fingers which through accident of fœtal position and movements, have stroked the lips. The position being favorable for insertion, the fingers would then be sucked before birth. This would be in conformity with the observations of Minkowski, who noted lip movements in response to stroking fingers on the lips of the 2-5 months human embryos. Note also Popper's findings on the newborn babe.

Minkowski, M., über frühzeitige Bewegungen, Reflexe und muskuläre Reaktionen bei menschlichen Fœtus und ihre Beziehungen zum fœtalen Nerven und Muskelsystem. Schweiz, Med. Wochenschr. 29, 721, July 20, 1922.

[4] Popper, E., " Studien unber Wangphänomene," Archiv. f. Psychiatrie u. Nervenkrankh, 63, 230, 1921.

Under "ludler" Lindner[4] includes a group in whom the sucking is accompanied by other movements, usually rubbing a part of the body with the other hand ("Ludler with combination"). Such movements accessory to sucking are considered in some of the individual case studies. Movements accessory to thumbsucking may be seen also as independent "habits" and might be included as a separate group. They are considered probably too mild for serious clinical attention.[5]

Such movements, accessory or independent, may often, though not always, be traced to the original feeding act; that is, movements accessory to thumbsucking were similarly and originally accessory during breast or bottle feeding.

CASE I.—Forced withdrawal from breast; fingersucking; accessory movements; deformity. Eva G., age 2 years, 4 months. (Michael Reese Dispensary Series No. 1, September 17, 1926.)

This child started to suck her right thumb at three to four days of age; later, at four months of age, changed to index finger of either hand, never sucking the left thumb; she sucks practically all the time, "day and night," except when running about outdoors. The finger is sucked up to the middle joint. If mother wraps up one or more fingers, she will suck any remaining finger. This she does avidly, making noise heard throughout the room. Intensity same since onset. Accessory movements: (1) Either keeps toy in other hand or strokes the ear; (2) while sucking index finger will rub adjacent finger lightly over upper lip. No masturbation.

Feeding.—Breast fed exclusively. After the first day she was "pulled" away from the breast and was never allowed to nurse fifteen minutes. No artificial pacifier was used nor was the breast allowed to serve as pacifier. While feeding the patient would often press down or pinch the other breast with the free hand.

Observation.—Child observed sucking its finger while falling asleep. After about ten minutes, the index finger dropped out of child's mouth, sucking movements continuing, this time of the tongue, which slightly protruded below the sucked finger, causing a protrusion of the lower lip. After one to two minutes, sucking of the tongue stopped to continue again with noise after ten to fifteen seconds, then in two to three minutes the sucking stopped, child apparently asleep with the tongue slightly protruded. (The mother had never noticed that the child is also a tongue-sucker, which, in the observation made, was caused by continued sucking movements after the finger dropped out of the mouth, the tongue still protruding, caught by the sucking lips.) The right index finger is held volar surface upward with

[5] Such acts include lip and finger, cheek rubbing, ear pulling, hair pulling, patting of body, rotation movements also of the free fingers of the hand sucked.

forward pressure against upper incisors. Ordinarily, when not sucking, the mouth is held open, lips and teeth parted. The upper incisors are rather large and over-ride the lower by 3 mm. They are not spaced. Physical examination shows evidence of early rickets with prominent frontal bosses, pot belly, flaring ribs, beading, widened wrists. At present, nutrition and intelligence normal.

Comment.—In this case the sucking habit occurring in the very first week of life may be related to the fact that the child was pulled away from the breast before it had been adequately nourished or before it had adequate sucking movements aside from the problem of nutrition. It is interesting that this child always had its proper weight. There was no lack of milk at the breast; withdrawal after ten to twelve minutes was by order of the physician at an Infant Welfare Station. The accessory movements during the sucking are probably a continuation of the activity of one of the hands during the breast feeding; that is, this child in its thumbsucking continues the pattern of the breast feeding act in regard also to accessory movements.[6] The slight over-riding is in relation to the direction of the pressure of the sucked finger which may also be complicated by the rickets. The change from thumb to index finger remains unexplained.

Case II.—Quick withdrawal from rapidly flowing breast; right thumbsucking and biting; accessory movements; masturbation. Gertrude G., age 2 years, 6 months. (Michael Reese Dispensary, Series No. 2, September 3, 1926.)

This child sucks only the right thumb; onset at two months of age. She sucks during most of the day and falls asleep sucking. Does not suck when running about with other children but whenever she leaves them she starts again. After falling asleep the thumb drops out of the mouth but should she turn over in bed, it returns to the mouth. Accessory movement is turning and twisting the left ear with the left hand, holding top of the ear. More recently than the sucking, is biting of the right thumb. Teeth marks are visible. Date of onset of the biting is not known. In the previous month masturbation has been noticed, "consisting in placing the left hand on the genitals with some pressure, often sucking the right thumb at the same time."

Feeding.—This child was breast-fed exclusively the first seven months, was on no schedule, fed whenever she cried, often falling asleep at the breast. Mother states that breast milk flowed very freely, there was

[6] Chandler, F., "Thumbsucking in Childhood as a Cause of Subsequent Irregularity of the Teeth," Boston Medical and Surgical Journal, 99, 204, 1878.

"much leaking," and though feeding was frequent child would turn its head away in a few minutes, presumably because of the too rapid flow. Fed chiefly on the right breast so that the right hand was free. No pacifier.

Observation.—Mother was asked to put the child in the original nursing position. This was done immediately and without apparent deliberation. The child's head was to the right breast, left hand being pressed against left ear; right hand free.

Examination showed protrusion of lower lip, some of the fine markings on the right thumb, especially the vertical lines, shallower than the left, also, a few of the large creases of the right thumb are absent at the phalangeal joint, right thumb somewhat swollen at the tip and the nail spread. Patient holds the left ear with the left hand pulling the body of the left ear forward. The upper incisors are slightly spaced, not pushed forward and not enlarged. Patient was observed sucking the right thumb. It was almost completely inside the mouth between the tongue and upper teeth, the bite being made chiefly at the root of the thumb, which was held taut in the mouth, volar surface of the thumb turned laterally. No masking; distinct sucking movements.

The general physical shows evidence of old rickets as in the preceding case. Intelligence and nutrition are normal.

Comment.—In this case judging by the position of the thumb in the mouth, and in spite of constant sucking, one would not expect much deformity because no special pressure was exerted forward or in any direction against teeth or jaw. The action, if this instance is typical of the others, is chiefly on the thumb. Protrusion of the lower lip is in keeping with the sucking position. The accessory left ear movement may be a takeover of the same activity during nursing and in this case the selection of the right thumb is in accordance with the favored breast. The thumb-sucking in this case may be related to the insufficiency of lip movements due to a too rapidly flowing breast. We would then have a completion of the nutritional but not of the lip sucking phase of the feeding act. In this case, although rickets was present, there is very little, if any, deformity of the teeth. Since it has been shown in a number of cases that deformity within the arch is in relation with the direction of the pressing finger, rickets would be a secondary factor in that it would allow greater deformity than otherwise. The masturbation in this case may be regarded as an acquired accessory movement during the sucking act.

CASE III.—Quick spontaneous withdrawal from rapidly flowing breast; fingersucking; no deformity; no accessory movements. Kathleen, age 24 months. (Michael Reese Dispensary, Series No. 3, September, 1926.)

This child sucks fingers, left digits number one and two; onset, the first week of life. When these fingers are tied, she sucks the first and second fingers of the right hand. The pleasure sucking occurs chiefly when she is asleep or tired.

Feeding.—Exclusively breast. In the early months there was much "overflowing," "her mouth would fill up with one suck." Though there was evidence in this child of rickets, there were no special differences in the hands nor any mouth deformity. The sucking was the mild "mincing" kind with the volar surface of the fingers turned downward, exerting very little pressure.

Physical examination shows evidence of old rickets. Child is very bright according to test scores and general behavior. Weight and strength, good.

Comment.—The method of sucking as observed in this case produces little or no pressure on palate or teeth. The sucking is a rapid movement of the fingers which are not firmly pressed. Though rickets is present, there is no deformity nor any apparent defect on the fingers sucked. No accessory movements were noted. Thumbsucking appeared to be in relation with inadequate sucking movements due to excessive milk flow, hence, starting very early in life.

CASES IV AND V.—Wilma and Ida, sisters of the above, age 2 years, 10 months respectively. (Michael Reese Dispensary, Series No. 4 and 5.)

Similar history, both have the sucking habit and practically the same feeding history. The older sister, however, is a tonguesucker.

CASE VI.—So-called accessory movements without finger-sucking; satisfactory feeding; nail biting; finger-picking. Frances T., aged 8 years. (Michael Reese Dispensary, Series No. 6, May, 1926.)

This case is included here as very suggestive because "accessory movements" alone are present in the form of ear pulling, onset during infancy. She catches her ear lobes between the flexed third and fourth fingers, sometimes pulling at the ears of other members of the family at the same time; frequency, at least three "sessions" every day. There has been no thumbsucking, no fingersucking, no tonguesucking. Nail-biting and also fingerpicking has occurred since infancy.

Feeding.—Breast fed exclusively the first eleven months, every four hours and held to the breast for fifteen minutes. Feeding was apparently satisfactory. During the breast feeding she would pull or pinch the mother's neck with the free hand.

Examination.—Examination shows no deformity of the mouth though the lower lip protrudes. Finger nails are bitten though not badly, upper incisors are spaced but do not protrude. Slightly underweight. Intelligence normal.

The ear pulling may be in relation to the activity at the breast and is of interest because it occurs independently of fingersucking with which it is usually associated. In this case we may have the explanation of the origin of the numerous mannerisms, forms of finger-play especially with hair, ears, face, even foreign objects, loom out of the pleasurable feeding act—aside from the question of sufficiency of lip movements. There is nothing in the history to explain the nail-biting or finger-picking, and the date of onset is not accurately remembered.

An interesting case that came to my attention in this connection was that of a boy of seventeen who had since early childhood the habit of rubbing the threads of his buttons. By the age of twelve, the mother states, he was losing three buttons a day but still had the habit at seventeen. When questioned about habits during breast feeding, the mother stated that while on the breast, he used to finger a mole, situated on the mother's neck, until his ninth month when, because of the "annoyance of it," the mother had the mole surgically removed. There was no thumbsucking.

CASES VII TO XIII.—To illustrate various pleasure habits, direct and "accessory" in same family; tonguesucking, fingersucking, lip-biting, nail-biting, "feeling," masturbation, ear pulling, pinching, squeezing.

In the "T" family, there are seven children with various infantile "pleasure habits," all of which may be in relation to the feeding experience. The oldest, age 14, is a tonguesucker and nail-biter. He was breast fed up to fourteen months and allowed to nurse *ad lib.;* slept with mother and used her breast as pacifier. While nursing he would pinch the mother's neck and scratch her breast with the free hand. During his tonguesucking he usually makes rolling movements on an object, preferably the hand or foot or ear of any other member of the family.

A sister, age 2 years, 11 months, also a tonguesucker was fed in the same manner, also making pulling or pinching movements on the mother's neck or breast while feeding. During tonguesucking, she makes rubbing or "feeling" movements on some other member of the family. When in bed her tonguesucking occurs without the accessory movements, as far as known.

Mildred, age 5, another tonguesucker, was on a four-hour schedule, timed feeding, weaned at eleven months and did not develop tonguesucking until about twenty months of age. With the sucking there are apparently no accessory movements. There was no night feeding; no pacifier.

James, age 11 years, 8 months, at the time of investigation, was a fingersucker until age 2; onset at probably three to six months. At about two to three years of age he acquired the habit of rubbing his lips. It is done with the right index finger. While on the breast he had accessory movements also like the other children. His sucking was with the first index and mid-

fingers of the right hand exclusively. Lip rubbing may be related in his case also to chapped lips during the winter which may aid in evoking earlier "accessory" movements or possibly cause the chapping. Breast feeding was unscheduled until six months, when he was weaned because of the mother's pregnancy. He slept with the mother the first six months.

Lewis, age 10 years, was, like the older brother, allowed to sleep with the mother all night and take the breast *ad lib*. During breast feeding he would pull or pinch the mother's neck, making scratching and playing movements on the other breast. He is a lip biter. He keeps the lower lip under the upper lip with slight protruding movements of the tongue. Date of onset is not known. He also holds his teeth over the under lip with biting movements. Masturbation, which is the chief complaint, started at one year while still nursing, and continues. With his hands in his pocket he toys with the penis "most of the time even when playing." This he used to do through the diaper. Whether this is also an accessory movement, a take-over of the constant playing of the free hand at the breast, later with the penis, is a question, not explained by the inadequate information in this case.

Frances, age 8 years, has been considered above (Case VI). The youngest child, Florine, age 13 months, when first seen was a fingersucker, onset third to fourth months. She sucks fourth and fifth digits of the right hand fairly constantly. During sucking, there is a pulling movement of the left ear with the left index finger. Sucking, though constant, is generally a quiet "mincing" movement. The action on the ear is a rhythmic pulling with the index finger touching the antihelix; also rubbing and squeezing movements. This child was breast fed eight months on a four-hour schedule, often pulled away from the breast after fifteen minutes; no night feeding; no pacifiers. During breast feeding the free fingers pulled at the mother's neck and scratched the other breast.

Although in the "T," a colored family, the dates of onset are not as specific as one would wish, and a number of details are lacking, there are some very suggestive findings in regard to accessory movements and to lip or tonguesucking. The feeding methods in this family can be divided into two types, scheduled and unscheduled. Of the seven children, four were allowed to nurse "whenever they wanted to," and of these, three slept with the mother and used the breast as pacifier. The fourth also did much "dawdling" at the breast. We may consider these four children as having excessive sucking movements. It is noteworthy that in all of them there is some form of lip or tongue habit, in one combined with fingersucking. Of the three who were "scheduled" feeders, two are fingersuckers with accessory ear pulling movements; the third a tonguesucker who developed the habit only after weaning at about twenty months.

Excessive sucking movements may help to explain some of these habits as contrasted with fingersucking in not one of whom, in the individual or group series, was such a history obtained.

In the "T" family also the accessory movements follow the general pattern of movements at the breast. In one case we have a "specific" lip rubber (James) with the right index finger, a habit supplanting the sucking of

right index and mid-fingers. The continuance of another habit with a previously "conditioned" finger is seen also in some cases of clitoris-finger-masturbation in girls. Where masturbation occurs in combination with thumbsucking it may be regarded as any other "accessory movement" which may later supplant the sucking act.[7, 8]

[7] How often infantile masturbation (by which is meant the habit of handling the sex organs without regard to the question of erection or orgasm) is a movement having its origin as accessory to fingersucking, cannot be accurately stated by our figures. In Lindner's group, infantile masturbation is explained in some cases as "a change in the active assisting hand and in the point of interest." Frequently when this takes place, the hand previously serving as Ludel (pacifier) or manipulating it, chooses an entirely different point of interest, frequently, the genitals." In Lindner's summary tables of "suckers according to age and type of sucking pursued," 69 cases are listed. The handling of penis or clitoris is mentioned as "combinatory movements" in two cases; navel, five; ear, five; nose, two. These movements are in relation to all types of sucking habits.

On the basis of Lindner's tables and according to our series, masturbation occurs as an accessory phase, of at least fingersucking, in a small percentage of cases. This would follow from the fact that the majority of thumbsucking cases have their onset in the first five months of life, at which time the hand movements are confined largely to the upper part of the body. Moreover, since many accessory movements can be traced to the behavior of the hands during breast feeding, such acts would of necessity be in relation to the head and neck of the child. Infantile masturbation does not usually occur before the sixth month. In a recent study of an "unselected" group of forty-nine male infants, where it was possible to get information on the date when handling of the genitals was first observed, the distribution was as follows:

Age in months at onset of masturbation	No. of cases
0 to 5	1
6 to 11	10
12 to 17	8
18 to 23	3
24 to 29	4
30 to 35	0

The observation was made by the mothers of 55 per cent of the entire group of forty-nine. The remainder stated that they had noticed no such behavior. This investigation was made in a "Baby Show" in the booth devoted to examining the genitals where such information was easily secured. It is very difficult to get information of this type for females because the method of masturbating is usually not easily observed (thigh squeezing, rubbing, etc.). In a similar investigation of twenty-six female infants, finger manipulation was observed in four cases; onset, six, eight, twelve and twenty-four months respectively.

PRIVATE SERIES.

CASE XIV.—Excessive flow at breast; no thumbsucking until decreased number of daily feedings. William E., age 6 years, 9 months. (Private Case Series No. 1, November, 1926.)

Thumbsucking until about five and one-half years; onset at two to three months. Before two months he was fed irregularly though frequently on the breast. There was excessive milk, "the breast always leaked." He was through in less than ten minutes though kept to the breast about "five more minutes." At two months he was put on a four-hour schedule. The one night feeding was withdrawn after the first month. Fingernail-biting had its onset at about five years, at which time there was probably less thumbsucking. Finger-biting alone after about five and one-half years of age. There was no evidence at the time I saw him of any deformity of the mouth or the thumb.

Examination shows evidence of early mild rickets, slight underweight, intelligence normal.

Comment.—In this case, in spite of a rapidly flowing breast, there was apparently sufficient play of lip movement until the second month when the interval between feedings with the diminished lip movements due to excessive flow may have been too great. Nail-biting is of special interest here since it seems to have grown out of thumbsucking, as a modified form due to attempts at curing the habit. However, there are in our series a number of cases of nail-biting in which no history of thumbsucking occurred.

CASE XV.—Similar to Case XIV. Excessive flow at breast; no thumbsucking until a period of insufficient milk. Daniel, age 18 months. (Private Case Series No. 1, September 14, 1927.)

Good health and intelligence. He sucks left thumb, onset between four and six weeks. Sucking is limited to periods of drowsiness, fatigue and occasional excitement. Breast-fed exclusively first six weeks, four-hour schedule, five feedings and one night feeding. Breast flowed very freely although supply of milk was probably scanty. Put first to left breast and then to right in each feeding. Little or no flow of milk at end-stage of the feeding period

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Since it is apparent from our figures that many more children manipulate the genitals at some time (at least sufficiently to be "corrected") than suck the fingers, such behavior cannot be explained in the main, as a derivative of "accessory movements" in pleasure-sucking (v. i. for frequency of fingersucking).

For cases of thumbsucking with quite overt sexual significance, see Lindner's article, and also

[8] Galant, F., "Sexualleben im Sauglings u, Kindes alter." Neurologisches Centralblatt, 38, 652, 1919.

which was timed at twenty minutes. He was taken away from the breast at the end of twenty minutes because "there was no milk and I didn't want him to go to sleep at the breast." When withdrawn from the breast would usually go to sleep after each feeding. For a period of two weeks, fourth to sixth, he would cry after the 6 p. m. feeding, which was apparently inadequate. At the sixth week, a supplementary feeding was added.

Comment.—The thumbsucking occurred somewhere in the period between the fourth and sixth weeks, at the point when the decrease in lip action was probably just sufficient for the development of the sucking habit. In this case the child remained at the breast nevertheless for 20 minutes. The milk would come very rapidly at first but towards the end-stage there was sufficient lip movements though scanty milk. The period between the fourth and sixth weeks may then be regarded as one in which the feeding balanced towards an incompleteness of the sucking phase of the feeding act.

CASES XVI, XVII AND XVIII.—Early thumbsucking; excessive flow. Robert, age 2 years, 3 months. (Private Case Series No. 1, November 20, 1926.)

Of good health and intelligence, in which the thumbsucking was incidental to the behavior problem. His two brothers, 6-month-old twins and himself started fingersucking within the first month or two. All were fed by the breast, were through in a very quick time, about five or ten minutes according to the mother. They were on four-hour schedule, five feedings daily, no night feeding. Mother thinks the breast flowed even more freely for the twins than for the first-born.

CASES XIX AND XX.—Shortened duration of breast feeding; forced withdrawal; thumbsucking. Edward, age 5 years. (Private case series Nos. 1 and 2, September 12, 1927.)

A specific left thumbsucker, onset in first few weeks before the mother left the hospital after childbirth. He was breast fed every three hours for the first five days, then every four hours, being pulled away from the breast at the end of ten minutes to be weighed. If the weight was regarded as sufficient, he was not returned to the breast until the next feeding. This child was always pulled away in the middle of his feeding and in most cases not returned to the breast until the next feeding. The right breast flowed more freely than the left.

The second child, a sister age 3 years, with the same history, was also a thumbsucker, onset in the first few weeks.

Comment.—In this case the thumbsucking is related in both cases to insufficiency of lip movements. There were no nutritional problems. They gained very well at the breast; physical examina-

tion negative; intelligence very superior. Of interest also is the selection of the left thumb which in this case may be in relation to the favored breast, also the first to be used in alternate breast feeding. In that case the left hand would be free, the right hand locked. (The child is righthanded.) What other factors operate in determining specific choice of thumb or finger are still to be worked out.

A number of problems indicated in the series of cases cited are left unexplored in this paper which is limited to the question of fingersucking, and certain movements associated with that habit. The cases are all suggestive in showing the close relationship between the sucking time and the sucking habit, independently of nutritional problems. Both dispensary and private cases were cited to show that there is no social selection in these habits. In each case of the private and dispensary series where fingersucking was found, insufficiency of lip sucking was also found.

"Unselected" Series.

In order to secure further data on this problem, advantage was taken of a "Better Babies' Conference"[9] to secure the feeding histories along with other pertinent data of a group of presumably healthy infants and children. In all, 112 such cases were secured, representing data in 66 families. Nineteen families contained one or more children (28) with the sucking habit for various periods of time. Statistical comparisons of these groups are exclusive of cases previously cited.

There are certain weaknesses, inherent in any type of investigation based on interviews, especially when the informants are untrained and have to rely on their memory for events often several years old. Moreover, a number of events bearing directly on this study often escape detection. Take, for example, the matter of pacifiers. Mothers reply with assurance concerning their use, if the artificial pacifier is referred to. When questioned as to the use of breast or bottle as pacifiers, a use to which they may often be

[9] The composition of this group, according to the fathers' occupations, is as follows:

Farmers, 48%; Business Men, 23%; Mechanics, 12%; Salesmen, 7%; Clerks, 4%; Miscellaneous, 4%; Laborers, 2%.

put, aside from feeding, or to the use of toys and other objects in the same way, it is difficult to get information.

Besides difficulties relating to information, accuracy and observation, there are sometimes difficulties in the attitude of the informants—in their cooperation. Mothers of babies at a certain Infant Welfare Station in Chicago, for example, invariably responded to the question of frequency and duration of infant feeding with the reply that they were always fed every four hours for twenty minutes by the clock. It was found out later that they preferred to be inaccurate than admit any violation of the rules of feeding laid down by the station. The questions were regarded by them as a check on their schedule. It is necessary, therefore, to state the purpose of the question and preferably to select groups, as in this study, who are in no "forced" relationship to the investigator.

In the "Baby Shows," mothers questioned at the end of the physical examination were told that questions were asked each year to get certain information for the doctors and that if they wished they might answer (and ask) questions about feeding; furthermore, these questions had nothing to do with the babies' "score" in the physical examination. There was not one instance of refusal to reply to these questions. All the mothers were apparently quite willing to give what information they had. In regard to artificial pacifiers, a rather ticklish question, since mothers in the community studied were taught that its use was "harmful" and proof of ignorant methods, there was probably an unwillingness to admit its use. Six mothers in our series acknowledged its use.

Some of the difficulties are, of course, inherent in the investigator—in his method of approach and of formulating questions. Experience teaches for example, that questions concerning the point of satiety in feeding are best asked in the form of "did he always draw his mouth away when he was through," "did the baby often fall asleep at the breast," "did you pull him away at the end of the twenty minutes," "did he cry at the end of each feeding"; rather than, "was the baby satisfied?"

In spite of all the pitfalls enumerated, certain investigations made possible by such interviews are quite important, especially

where a large series must be studied. Moreover, the accuracy can be aided by formulating objective questions and checking replies. In this series a large number were infants whose feeding methods were easily ascertained since the experience was very recent. Typical of this group, the same feeding method was practiced for children of the same family in the vast majority of cases.

Where numbers are used, accuracy is indicated by the use of phrases in the tables. For example, "about fifteen to twenty minutes" indicates that the feeding duration was estimated and necessarily inaccurate. Otherwise it is recorded as by the "clock" or "timed." "Never timed, all they want, no schedule," refers to the typical irregular feeding instituted by the cry of the child in which the duration of feeding depends on the child's falling asleep at the breast or withdrawing from the nipple with no apparent further desire to suck. The number of feedings per day in such cases were not estimated and are therefore not recorded.

The group of "unselected" children is divided into two series, the second consisting of families in which one or more fingersuckers are present, thereby making possible a direct comparison of the feeding of some children with and without the habit in the same family. The first series is a "negative" group, containing families whose children are free from the habit. An analysis of the cases follow and "contrast" table follows Series II.

Let us consider the nineteen families containing thumb or fingersuckers (Series II). For our purpose the series may be divided into three groups. In Group I we will select those families containing children with and children without the habit. We can thereby note the difference in these children and their method of feeding. In Group II we will consider children whose habits followed a change in the method of feeding. The remainder will be included in Group III, a miscellaneous group.

GROUP I.—(Families containing children with and children without the habit.)

Family No. 1. In this family there are two children; No. 1 is a thumbsucker; No. 2 is not. Child No. 1 was fed by a dropper only, during the first two weeks of life, then various schedules were used with poor gain. The birth weight was only four pounds. Child No. 2 was on the breast every three hours, twenty minutes feeding; was satisfied before that time but held to the breast during that period. No. 1 was the weaker baby and had no sucking "release" in the first two weeks, the lip movements being unneces-

SERIES I.

FAMILIES WITH NO INSTANCE OF THUMBSUCKING OR FINGERSUCKING IN THE CHILDREN.

Family No.	Age of mother.	Occupation of father.	Children[1] No.	Children[1] Age Yr.Mo.	Thumb sucking.	Breast or bottle.	Feeding schedule,[2] frequency and duration.	Night feeding.	Pacifier.	Remarks.
3	32	Farmer	2	0—10 3— 6	None	Breast	Never timed "All they want" No schedule	1	None	
4	28	Farmer	1	0—10	None	Breast	Never timed "Till they quit" No schedule	2-3	None	Breast 9 to 10 months
5	29	Restaurant owner	2	2— 0 1— 5	None	Breast	Until through Sometimes asleep at breast Never pulled away About 15 to 20 minutes No schedule	1	None	Breast 7 to 8 months
6	30	Insurance salesman	1	1— 6	None	Br. to 3 mo. Then bottle	Until through q. 3 hours	q. 4 hr.	None	Breast "gave out" third month
7	32	Banker	2	3— 7	None	Breast	Until through About 15 to 20 minutes Often asleep at breast first 6 months No schedule	1	None	Weaned at 14 monhts
8	29	Farmer	1	0— 9	None	Br. 1 month Then bottle	20 minutes by clock q. 3 hours "Would be through in that time and held to it" Thinks through in 15 min.	None	None	Breast 9 to 10 months
9	22	Car inspector	1	1— 6	None	Br. 5 weeks Then bottle	Not timed on bottle q. 3 hours 20 minutes by clock on breast and was through "Would push bottle away in 15 to 20 minutes"	1 bottle	None	
10	22	Highway commissioner	1	1— 8	None	Breast	"Allowed all he wanted" Often asleep at breast q. 3 hours	Several	None	
11	26	Grocery store	1	0— 6	None	Breast	Until through About 15 minutes q. 3 hours Often asleep at breast	None	None	

[1] Where but one age is given it is the age of the child examined.

[2] All quotations are by the mothers. The duration of feeding is estimated and necessarily inaccurate unless recorded as "By the clock" or "Timed."

SERIES I.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children[1] No.	Children[1] Age Yr.Mo.	Thumb sucking.	Breast or bottle.	Feeding schedule,[2] frequency and duration.	Night feeding.	Pacifier.	Remarks.
12	35	Salesman	3	2— 6	None	Br. 3 weeks and bottle Then bottle only	Until through About 10 to 15 minutes Often asleep at breast No schedule	1	None	Nicked nipple at 9 months
13	33	Mechanic	1	3— 8	None	Br. 5 months Then bottle	Until through Often asleep at breast q. 2 hours	1	None	
14	35	Jail guard	1	3— 5	None	Br. 6 weeks Then bottle	12 days at hospital and timed 20 minutes At home about 30 minutes "As long as wished" Often asleep at breast No schedule	1	None	
15	39	Banker	3	3— 3	None	Breast	Not timed q. 3 hours Often asleep at breast	1 until 3 months	None	Breast to 9 months
16	26	Carpenter	1	2— 3	None	Breast	Until through About 15 minutes q. 4 hours Often asleep at breast	1	None	Breast to 11 months
17	26	Farmer	2	1— 7	None	Br. 6 months Br. and Bot. to 9 months Then bottle	Not timed Until through No schedule Often asleep at breast	1-2	None	
18	26	Farmer	1	2— 9	None	Br. 12 months After 4 wks. occasionally cream of wheat once daily	10 minutes by clock q. 3 hours Pulled away from breast	None	None	Often allowed breast as pacifier first six months
19	30	Service station manager	2	3— 0 2—10	None	Bottle and breast	Until through about 10 minutes q. 3 hours	1 until 6 weeks	None	
20	35	Farmer	3	1— 1	None	Br. 6 weeks Then bottle	No schedule Frequency and duration not estimated	1-2	None	
21	27	Farmer	1	1—10	None	Br. 15 months	Until through q. 2 hours Often asleep at breast	1	None	

[1] Where but one age is given it is the age of the child examined.
[2] All quotations are by the mothers. The duration of feeding is estimated and necessarily inaccurate unless recorded as "By the clock" or "Timed."

"Timed."

SERIES I.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children[1] No.	Children[1] Age Yr.Mo.	Thumb sucking.	Breast or bottle.	Feeding schedule,[2] frequency and duration.	Night feeding.	Pacifier.	Remarks.
22	25	Mechanic	3	1— 5	None	Br. 7 months Br. and bottle to 12 months	Until through Usually 12 minutes by clock q. 3 hours Often asleep at breast	1	None	
23	26	Teacher	1	1— 1	None	Br. 3 months Br. and bottle to 4 months Then bottle	Until through Much action at breast but little milk Never asleep at breast but often after bottle Bottle q. 4 hours, about 20 minutes	1	None	
24	31	Farmer	1	0—10	None	Br. 4½ months Then bottle	Until through q. 2 hours first 2 months Then q. 3 hours Often asleep at breast	2	None	
25	25	Farmer	2	0— 9	None	Breast excl.	"Whenever hungry" Until through Often asleep at breast Often asleep with mother	1-2	None	Breast as pacifier when hurt or cried
26	31	Postal clerk	2	1— 2	None	Bottle	q. 3 hours first 2 weeks Then q. 4 hours Not timed, through in 15 minutes 1-2 water bottles daily	None	None	Both adopted at two months
27	36	Farmer	5	1— 7	None	Breast	q. 3 hours Never pulled away Often asleep at breast	(1-2 only water bottle)	None	Chewed rubber dolls
28	28	Farmer	1	1— 7	None	Breast	Until through Not timed, about 20 minutes q. 3 hours	1	None	Sucks rubber dog and rubber doll
29	33	Farmer	2	0— 6	None	Br. 5 months Then bottle	q. 3 hours to 5 months Then q. 4 hours 30 minutes first 2 months Since then through in 20 minutes Often asleep at breast	q. 3 hrs. first month Then one	None	Since 5 months has chewed celluloid ring

[1] Where but one age is given it is the age of the child examined.
[2] All quotations are by the mothers. The duration of feeding is estimated and necessarily inaccurate unless recorded as "By the clock" or "Timed."

SERIES I.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children [1] No.	Children [1] Age Yr. Mo.	Thumb sucking.	Breast or bottle.	Feeding schedule,[2] frequency and duration.	Night feeding.	Pacifier.	Remarks.
30	18	Farmer	1	0— 6	None	Breast excl.	Until through q. 3 hours Often asleep at breast	1	None	
31	27	Farmer	1	1— 7	None	Breast	Until through Not timed q. 4 hours first month though irregular "Turned head away"	Whenever awake at night Usually one	None	Chewed rubber rattle
32	35	Butcher	3	3— 7	None	All breast	Until through q. 3 hours first month Often asleep at breast Also water bottle	No record	None	Celluloid ring at 3 months
33	24	Farmer	1	0— 9	None	Breast	Until through q. 3 hours Often asleep at breast Never pulled away	No record	None	Bites playthings
34	24	Farmer	2	1— 8	None	No. 1 bottle No. 2 breast	Whenever cried q. 2 hours (Same schedule for both) Never pulled away No. 2 often asleep at breast 1-2 water bottles daily	3	None	Chewed on toys
35	26	Machinist	2	1— 9	None	Breast	Allowed to finish q. 3 hours first 6 months Practically never pulled away Often asleep at breast	2-3	None	No. 2 chewed celluloid ring and toys
36	34	Farmer	4	0— 6	None	All bottle	No. 1 q. 2 hours No. 2 q. 3 hours No. 3 and No. 4 never timed Usually asleep after bottle Water bottle q. 2 hours or between each feeding	All 1 water bottle	None	No teething ring No. 4 chews back of hand

[1] Where but one age is given it is the age of the child examined.
[2] All quotations are by the mothers. The duration of feeding is estimated and necessarily inaccurate unless recorded as "By the clock" or "Timed."

SERIES I.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children[1] No.	Children[1] Age Yr.Mo.	Thumb sucking.	Breast or bottle.	Feeding schedule,[2] frequency and duration.	Night feeding.	Pacifier.	Remarks.
37	22	Farmer	1	0— 7	None	Br. 4 months Then supplemented	Would finish in less than 15 minutes and awakened to make nurse 20 minutes q. 3 hours Often asleep at breast Water bottle twice daily	1	None	No toy chewing
38	27	Farmer	2	0— 6	None	Breast	Until through Never timed "Whenever I thought they needed it" Often asleep at breast Water from spoon	1-3	None	Sucked on rubber doll first month
39	29	Farmer	4	0—10	None	Breast	Until through q. 3 hours Often asleep at breast Water bottles first 2-3 months	2-3	None	Chewed on toys
40	23	Insurance agent	1	0— 7	None	Br. 6 months Then bottle	Until got enough q. 2 hours 2 months Then q. 3 hours Often asleep at breast Water bottle 2 months, then from glass	2-3	None	Chews on rings
41	34	Clerk	2	1— 1	None	Breast	Allowed to finish About 15-20 minutes q. 3 hours Often asleep at breast 3-4 water bottles daily	1	Yes	
42	23	Farmer	1	1— 9	None	Breast	Until through No schedule Often asleep at breast	1	Yes since 1 wk.	
43	30	Clerk	1	2— 6	None	Br. 2 weeks Then bottle	Until through q. 4 hours breast and bottle About 15 minutes Many bottles water daily	2	None	Appears undernourished

[1] Where but one age is given it is the age of the child examined.
[2] All quotations are by the mothers. The duration of feeding is estimated and necessarily inaccurate unless recorded as "By the clock" or "Timed."

SERIES I.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children[1] No.	Children[1] Age Yr.	Children[1] Age Mo.	Thumb sucking.	Breast or bottle.	Feeding schedule,[2] frequency and duration.	Night feeding.	Pacifier.	Remarks.
44	28	Farmer	1	0	9	None	Breast	Until through Whenever hungry Often asleep at breast Bottle of water whenever cries	1	Yes	
45	20	Printer	2	2	0	None	No. 1 br. 4 mo. Then bottle	Until through 10-15 minutes q. 3 hours Never asleep at breast Bottle water daily	q. 3 hr.	None	Sucked rubber dolls
				1	11	None	No. 2 br. 2½ mo. Then bottle	Same as No. 1 until 2½ months Then bottle because of insufficient milk	q. 3 hr.	None	Sucked rubber dolls
46	24	Farmer	1	0	10	None	Breast	Until through q. 3 hours first few months Never asleep at breast Water from cup or spoon	3	None	Sucks rubber dolls
47	23	Miner	1	1	3	None	Breast	Until through 12-20 minutes q. 2 hours 4 months Then q. 3 hours Often asleep at breast	2	None	Since 5 months has chewed dolls
48	22	Grocer	1	1	2	None	Breast	Until through q. 3 hours Often asleep at breast Water bottle 3-5 times daily	1	None	Does not chew toys
49	27	Salesman	2	0	8 Twins	None	Breast	Until through Irregular, about 5-6 feedings daily Often asleep at breast	2	None	Both suck toys
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[1] Where but one age is given it is the age of the child examined.
[2] All quotations are by the mothers. The duration of feeding is estimated and necessarily inaccurate unless recorded as "By the clock" or "Timed."

SERIES II.

FAMILIES WITH ONE OR MORE INSTANCES OF THUMBSUCKING OR FINGERSUCKING IN THE CHILDREN.

Family No.	Age of mother.	Occupation of father.	Children No.	Children Age Yr.Mo.	Thumb[1] sucking.	Breast or bottle.	Feeding schedule, frequency and duration.	Night feeding.	Pacifier.	Remarks.
1	33	Contractor	(Two) 1	Over 6 yr.	Yes	Dropper 2 weeks Then bottle	Various schedules Fed with difficulty Only dropper first 2 weeks	No	No	Weight at birth 4 pounds No record of onset of thumbsucking
			2	4—11	No	Breast	q. 3 hours 20 minutes by clock Satisfied but held to 20 minutes	No	No	
2	35	Farmer	(Four) 1		No	Breast	All following schedule q. 3 hours	Several	No	
			2		No	Breast	Until through Often asleep at breast	Several	Yes	No. 2 given pacifier when he cried
			4	1— 2	No	Breast		Several	No	
			3		Yes	Breast except first 2 weeks	Hospital first 2 weeks Schedule set by hospital nurse and details of feeding No. 3 at that time not known	Several	No	No. 3 thumbsucking to 5½ years Onset first 2 weeks
3	26	Farmer	(Two) 2	0—10	Yes	Breast	q. 3 hours Untimed feeding to 2-3 months when doctor limited duration to 5 minutes and child was pulled away from breast after that period. (This was done to cure constipation)	1	No	No record for No. 1, a non-finger sucker No. 2 thumbsucking occasionally (Whenever hungry or about to go asleep) Onset at about 3 months
4	26	Farmer	(Two) 1	2— 0	No	Br. 3½ months Then bottle	On breast until turned away apparently dissatisfied, "no milk" About 15-30 minutes Bottle q. 3 hours; 15 min. Hole enlarged	None after 2 weeks except water bottle	No	No record for feeding No. 1 No. 2 thumbsucking occasionally, first observed at 3 months Allowed to "chew" beads and rubber ring since 3 months
			2	0— 9	Yes					

[1] Where thumbsucking or fingersucking occurs, details as to onset and frequency are described under heading "Remarks."

SERIES II.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children No.	Children Age Yr.Mo.	Thumb [1] sucking.	Breast or bottle.	Feeding schedule, frequency and duration.	Night feeding.	Pacifier.	Remarks.
5	34	Electrician	(Five) 1 and 2		Yes	Br. 5 weeks Then bottle	No schedule 5 weeks, but "no milk" Then bottle q. 3 hours Through in 20 minutes Not pulled away	If they woke at night	No	Thumbsucking to 4-5 years
			3		No	Bottle	Bottle from birth No schedule	If they woke at night	No	
			4		No	Br. 3 months Bottle after 2 months	Took breast O. K. Then breast and bottle 1 month No schedule	If they woke at night	No	
			5		No	Br. 2 months Then bottle	Breast O. K. 2 months Then bottle No schedule	If they woke at night	No	
6	35	Farmer	(Two) 1		No	Breast	Whenever hungry Not timed 2 water bottles daily	No	No	
			2	2—0	Yes	Breast	q. 3 hours Pulled away after 20 min. 2 water bottles daily	No	No	Onset of thumbsucking No. 2 at 3 weeks, but O. K. within a month "by pulling thumb out of mouth"
7	26	Ford dealer	(One) 1	0—5	Yes	Breast	Time 20 minutes q. 2 hours Not pulled away At 4 months changed to 10 minutes by the clock and often pulled away	One to 3 months None since	No	Thumbsucking onset at 4 months. Usually when put to bed immediately after nursing. Never when asleep. Sucks right thumb or left digits 4 and 5 (Is underweight—no gain in past month)
8	33	Mail carrier	(Four) 4 1, 2, 3, 4	2—7	Yes	All breast except No. 4 who was partly bottle fed	As long as desired Nursed to sleep q. 2 hours first day Then q. 3 hours to 6 weeks After 6 weeks q. 4 hours	One to 6 months None since	No	All sucked right thumbs at about 6-12 months Rubber rings when teething Treated by pulling thumb from mouth and tying (Left breast larger but same feeding time for each breast)

[1] Where thumbsucking or fingersucking occurs, details as to onset and frequency are described under heading "Remarks."

SERIES II.—*Continued.*

SERIES II.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children No.	Children Age Yr.Mo.	Thumb[1] sucking.	Breast or bottle.	Feeding schedule, frequency and duration.	Night feeding.	Pacifier.	Remarks.
9	22	Auto dealer	(Three) 1		Yes	Breast	q. 2 hours first week q. 3 hours second week Later q. 4 hours but not exact At breast until satisfied. "Had too much milk, a lot of it ran away" No. 1 would be through very quickly and "often so much milk he would turn face away."	1	No	Onset by 1 month, sucked left thumb only Stopped spontaneously after teasing at 24 months. (Not left handed)
			2 and 3 (twins)	age 1—4	No	Breast	Not too much milk since change of breast and one twin per breast Same method as for No. 1	1	No	
10	25	Auctioneer	(Four) 4	1—1	Yes (All)	Breast	Excessive flow First few weeks "often turned head away from breast it came so fast q. 3 hours At hospital gave ice packs because overfilled breast Pumped own breast after No. 3 weaned	1	No	All thumbsuckers, but girls (No. 1 and No. 3) are milder and spontaneously cured Onset for all first month No. 2, now 5 years old, is still a thumbsucker "when sleepy"
11	21	Farmer	1	1—9	Yes	Br. 6 weeks Then bottle	Though plenty of milk no gain on breast First 6 weeks often pulled away from breast q. 3 hours "She didn't nurse as long as she wanted to" at breast or bottle, but gained O. K. on bottle	No record	No	(A second child died at birth) No. 1 sucked right thumb, which is calloused Onset first month Still sucks now while falling asleep
12	42	Druggist	(One) 1	1—0	Yes	Bottle only	Protein milk 8 months "Ravenous" during feeding Would get through in 10-15 minutes though on 20 min. schedule q. 3 hours 2 months Then q. 4 hours Also 1-2 water bottles daily	1		Sucked right thumb only Onset 1-3 months

[1] Where thumbsucking or fingersucking occurs, details as to onset and frequency are described under heading "Remarks."

SERIES II.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children No.	Children Age Yr. Mo.	Thumb[1] sucking.	Breast or bottle.	Feeding schedule, frequency and duration.	Night feeding.	Pacifier.	Remarks.
13	35	Decorator	(One) 1	2—4	Yes	Br. 9 months Bottle added at 3 months	Vomited after each feeding until 9 months q. 3 hours to 5 months Then q. 4 hours Pulled away from breast in 10 minutes by the clock by order of doctor	No record	No	Onset at 6 or 7 months Probably earlier but not before 4 months Sucked left thumb to 10 months, then left index finger which is still sucked Crybaby to 4 months Left thumb is calloused Aloes, etc., to fingers without success Spaced overriding upper incisors
14	20	Farmer	(One) 1	1—3	Yes	Br. 4 months Then bottle	q. 3 hours 3 months Then q. 4 hours Gain O. K. first 2 months, then poor again Taken off breast at 4 months because poor gain Not timed at breast "Whenever I thought he had what he should have, I pulled him away" (*i. e.*, when he would play) Water from spoon occasionally	1 until 2 months None since	No	Thumbsucking first noticed at about 6 weeks Still sucks a left finger occasionally when sleepy (observed during examination)
15	24	Farmer	(One) 1	1—0	Yes	Br. & bottle since first week	"Tried breast first month and failed" (i. e., poor gain in weight) Occasionally asleep at breast q. 2 hours "Cried so much after feedings" Bottle nipple enlarged, through in 5-10 minutes	No record	No	Sucks left fingers. No. 2 and No. 3, onset within first month Pacifier tried a few times at 4-5 months

[1] Where thumbsucking or fingersucking occurs, details as to onset and frequency are described under heading "Remarks."

SERIES II.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children No.	Children Age Yr. Mo.	Thumb[1] sucking.	Breast or bottle.	Feeding schedule, frequency and duration.	Night feeding.	Pacifier.	Remarks.
16	30	Farmer	(One) 1	1—0	Yes	Br. 3 months Bottle added at 3 months	q. 3 hours 3 months Then q. 4 hours Gain O. K. first 2 months, then poor again Taken off breast at 4 months because poor gain Not timed at breast "Whenever I thought he had what he should have, I pulled him away" (*i. e.*, when he would play) Water from spoon occasionally	1 until 2 months None since	No	Thumbsucking first noticed at about 6 weeks Still sucks a left finger occasionally when sleepy (observed during examination)
17	24	Farmer	(One) 1	1—0	Yes	Br. & bottle since first week	"Tried breast first month and failed" (i. e., poor gain in weight) Occasionally asleep at breast q. 2 hours "Cried so much after feedings" Bottle nipple enlarged, through in 5-10 minutes	No record	No	Sucks left fingers. No. 2 and No. 3, onset within first month Pacifier tried a few times at 4-5 months

SERIES II.—*Continued.*

Family No.	Age of mother.	Occupation of father.	Children No.	Children Age Yr.Mo.	Thumb[1] sucking.	Breast or bottle.	Feeding schedule, frequency and duration.	Night feeding.	Pacifier.	Remarks.
16	25	Farmer	(Two) 2	2—6	No	Breast	q. 3 hours Not pulled away Through in 20 minutes 2-3 bottles water with spoon daily	1	No	No. 1 died shortly after birth
			3	0—10	Yes	Br. 3 months Then bottle	Breast q. 3 hours 3 months Bottle q. 3 hours to 6 months After 6 mo. bottle q. 4 hours Allowed 20 minutes and then pulled away first 2 weeks No gain and allowed until through (30 min. by clock) At 10 months 4 bottles daily	1	No	Onset 2 weeks ago, now 10 months old Thumbsucking occasionally during day, either thumb
17	25	Produce business	(Two) 1		Yes	Breast	q. 3 hours Often asleep at breast Gain O. K. and at breast 7 months "though breast swollen"	1	No	Sucks left thumb only Onset at 3 months Sucking only when falling asleep Died at 11 months of pneumonia
			2	0—4	No ?	Breast	Same schedule as No. 1, but more milk for No. 2	1	No	Fingers in mouth when teething (but no sucking movement)
18	36	Farmer	(Four) 1		No	Breast (all)	All same method of feeding Breast q. 3 hours Tried water bottle but wouldn't take it Until through About 10-15 minutes	2	No	(No. 1 more irritable, "when other children were cross they put their fingers or thumb in their mouths") Onset of thumbsucking in No. 2 and fingersucking in No. 3 and No. 4 by first month
			2, 3, 4		Yes					
			4	1—6						
19	18	Laborer	(One) 1		Yes	Breast	q. 3 hours Breasts very full "Sometimes so full of milk, he would turn his head away" Rarely fell asleep at breast	Occasionally	No	Used teething ring at 7 months Sucks right index finger only (observed during examination) Onset by first month

[1] Where thumbsucking or fingersucking occurs, details as to onset and frequency are described under heading "Remarks."

sary since a dropper was used during this time. We have, then, two factors for the explanation of the thumbsucking habit in the first child, the nutritional and the sucking factor.

Family No. 2. In this family there are four children, of whom but one, No. 3, is a thumbsucker. All these children were fed every three hours and allowed to remain at the breast as long as they wished. No. 3 alone had his first two weeks in a hospital when the mother was ill, and he was fed by the nurse's direction. The exact details are not remembered by the mother. We can conclude only that No. 3 had a different feeding schedule from the others in the first two weeks. It is important to note that the onset of thumbsucking was at about two weeks of age, hence related to the first two weeks' experience.

Family No. 5 contains five children, of whom No. 1 and No. 2 are thumbsuckers; the others, free. The difference noted in the first two is the difficulty in their breast feeding the first five weeks, after which because of poor gain in weight they were put on the bottle. With No. 4 and No. 5 there was no special difficulty whether on breast or bottle. Otherwise the feeding schedule was the same for all. In this family the nutritional factor differentiates the thumbsuckers from the others.

Family No. 6 contains two children. No. 2 is a thumbsucker. No. 1 was fed whenever hungry and as long as he wished. No. 2 was put on a three-hour schedule and pulled away from the breast after twenty minutes. However, the thumbsucking was mild, onset at three weeks and cured within a month by "pulling his thumb out of his mouth." In this case the difference is in the "time" (sucking) factor.

In Family No. 9 there are three children, of whom only No. 1 was a thumbsucker. No. 2 and No. 3 are twins. The feeding method was the same for all; however, the flow of milk was excessive, so much so that the child after a very short time at the breast would turn his head away. The twins could more easily take care of this supply and their feeding was satisfactory. The cause of the habit, too rapid feeding, is primarily a "time" (sucking) factor, since the nursing period was considerably shortened, and there was no nutritional problem. In this case as in others where the thumbsucking is attributed to excessive flow at the breast, it begins very early in life.

In Family No. 16, No. 2 of the two living children was a thumbsucker. We have two differences in the feeding method. No. 2, the thumbsucker, was changed from a three- to a four-hour schedule when six months old and pulled away from the breast after twenty minutes. Since there was no gain in weight, he was, after two weeks of the four-hour schedule, allowed to nurse thirty minutes at a time. The thumbsucking began shortly after the four-hour schedule. No. 1 was on a three-hour schedule and allowed to nurse *ad lib*. In this family the differences are in the nutritional and the "time" (sucking) factors.

In Family No. 18 there are four children, of whom No. 2, No. 3 and No. 4 became fingersuckers or thumbsuckers by the second or third day. No. 1 remained free from the habit. The same method of feeding was used for all. There is nothing to explain this case by either sucking or nutritional factors on the data at hand.

GROUP II.—(Includes those children whose sucking habits followed a change in the method of feeding.)

In Family No. 3 a child of ten months whose habit started at about three months was breast fed every three hours, duration not limited. Until he was three months of age the same frequency was continued, but the duration was limited by the doctor's orders to five minutes, after which time the child was pulled away from the breast. In this case we have only the "time" (sucking) factor to account for the thumbsucking.

Family No. 4. In this family we have data on one child who is nine months old, in which the thumbsucking was first observed at three months, and then only occasionally. It was on the breast every three hours, estimated duration fifteen to thirty minutes, and often turned the head away. At three or four months of age it was placed on the bottle, the nipple of which was nicked. The frequency was as previously, duration now estimated at about fifteen minutes. There was no night feeding after the first two weeks. Of interest is the fact that the habit was established after a change in the feeding method. In looking for an explanation, we may consider the possibility of a too free flow, such as often occurs when the nipple is enlarged. However, the feeding time was not controlled by the clock, and a time explanation can only be assumed. Note, moreover, that no pacifier was used and that the child was allowed to "chew on beads and a rubber ring" since about three months of age; also that the sucking habit was a very mild one.

Family No. 7. A five-month-old child in whom thumbsucking began at four months, practically coincident with a change in the feeding schedule. Previously it was fed every two hours during the day, allowed twenty minutes for feeding time. This was entirely satisfactory, since it was never necessary to pull the child away from the breast during that period. At four months the nursing time was changed to ten minutes and he was often pulled away from the breast after that period of time. He has made no gain in the past month. In this case both the time (sucking) and the nutritional factors are present.

In Family No. 13 thumbsucking had its onset in a child of two years at somewhere between four and seven months. In this case the child was pulled away from the breast after a ten-minute feeding by the clock. Feeding frequency was every three hours until five months, and then every four hours. Assuming that the sucking had its onset at about five months or later, we would infer that the three-hour frequency and ten-minute duration was sufficient for the completion of the lip movements necessary in the feeding act, even though the child was pulled away from the breast. When, however, the interval between feedings was increased, the insufficiency of sucking movements resulted in the sucking habit. (Note also that the child, according to the mother, was a "cry-baby" until about four months old, at which time the sucking began. Since there was apparently no nutritional disturbance, the question of a relationship between the "incompleteness" of the feeding act and crying is suggested. It is a common observation that the thumbsucking baby is a "quiet" baby.)

GROUP III.—(Includes the remaining eight families.)

In Family No. 8 there are four children, all thumbsuckers, from about the sixth until the twelfth month of life. We may infer that the mother's statements are likely to be accurate for the youngest child, age two years seven months when examined. All were breast fed except No. 4, who was partly bottle fed. Each child had the following schedule: duration as long as desired, in the early months often "nursed to sleep"; frequency, every two hours on the first day and then every three hours until the sixth week; after six weeks, every four hours and one night feeding until six months; no pacifier; night feeding withdrawn at six months. In all these cases the habit was cured by pulling the thumb away from the mouth whenever observed and tying the sleeve at night. In each case only the right thumb was used. All the instances may, therefore, be considered mild. We have in these children a progressive diminution of the sucking time with finally withdrawal of the night feeding at six months. This is more significant in this family since the early feeding was unscheduled. The balancing of sucking-time is noted also in cases No. 14, No. 19 and No. 20.

Family No. 10. In this family there are four children, all thumbsuckers from the first month of life. They were all breast fed; there was an excessive flow at the breast, especially in the first few weeks. They "often turned the head away from the breast; it came so fast." At the hospital ice packs were used because of "overfilled breasts." After No. 3 was weaned, the mother pumped her own breast because it was constantly filling. In this case also the explanation is in the "time" (sucking) factor; also, as already noted, where thumbsucking occurs because of excessive breast flow, the onset is very early in life.

In Family No. 11 we have one living child whose thumbsucking began in the first month of life. The mother says there was plenty of milk, but the child did not gain on the breast. Because of inadequate gain in weight, he was changed to the bottle at six weeks. By this time the thumbsucking habit had already started, but he was often pulled away from the breast. There is no record, however, of the nursing period, although the frequency was every three hours. However, the pulling away from the breast is sufficient to indicate incompleteness of lip movements.

In Family No. 12 there is one child whose thumbsucking began sometime in the first three months. He was never on the breast. A protein milk diet was used the first eight months. It would get through with its feeding in ten to fifteen minutes and appear hungry (or "ravenous") after that time. In this case again the "time" (sucking) factor (complete nutritional, incomplete lip phase) is evident.

In Family No. 14 there is one child, one year three months of age; fingersucking, first noticed at about six weeks. The mother's statement that "whenever I thought he had what he should have I pulled him away" allows the inference of insufficient time for sucking movements.

Family No. 15. In a child aged twelve months fingersucking began within the first month. Breast and bottle feedings were used. After the first week the child failed to gain weight in the first month and "cried so much after

each feeding." Frequency was every two hours. The child occasionally fell asleep at the breast. In this case only the nutritional factor is present. (The rubber pacifier was tried at four or five months, but since its use followed the onset of fingersucking, it need not concern us here.)

In Family No. 17 there are two children. In No. 1 thumbsucking began at three months and occurred only during sleep. According to our data there is nothing to explain the habit, which was mild. In No. 2 the mother spoke about fingersucking, onset at about six months, which, however, never really occurred. After the sixth month the child would run its fingers over its gums while teething, but I observed no true sucking movements.

Family No. 19. In a child one year six months old thumbsucking began in the first month of life. We have in this case very clear evidence of excessive flow at the breast. "They were sometimes so full of milk he would turn his head away" and, as in other similar cases, thumbsucking began within the first month of life.

Of the 28 cases of fingersucking in the "unselected group," 24 are traceable to some feeding difficulty; primarily the sucking phase of the feeding act. In six of seven families containing fingersuckers and non-fingersuckers within each family, the difference in their feeding method is in the sucking phase. In the twenty sample cases of dispensary and private patients where more complete information could be obtained, the sucking phase was incomplete in all. Conversely, of the 49 families containing 81 presumably healthy children, all free from the habit of thumbsucking, there was but one instance of forced withdrawal from the breast (Series I, family No. 18) and in that case the breast was allowed to be used as pacifier.

The entire picture of the "unselected" groups is presented in the tables that follow.

In Table I, the contrast in relation to feeding and the point of "satiety" is striking. Of the 94 cases only one is a forced withdrawal, 99 per cent are "satisfactory, spontaneous withdrawals." Of the thumbsucking list, only 28 per cent come in the latter group. Thirty-nine per cent are "unsatisfactory, spontaneous withdrawals," 25 per cent "forced withdrawals."

In the "duration of feeding period," the non-fingersucking group contains a relatively larger number of untimed periods. Where the feeding time has been estimated or observed there are in the fingersucking group a relatively larger number of short time feedings. In the entire group (both series) 51 feedings, the duration was estimated or observed. Of these, 22 were less than and 29

TABLE I

FEEDING AND POINT OF SATIETY.

	Non finger suckers.		Finger suckers.		Total.	
	No. of children.	Per cent.	No. of children.	Per cent.	No.	Per cent.
A. *Spontaneous Withdrawal "Satisfactory."*						
1. Spontaneous withdrawal of head after feeding, apparently satisfied.						
a. *No Time Schedule.* Allowed to feed "until they get through," "all they wanted," "often fall asleep at breast," and similar expressions denoting apparently spontaneous withdrawal from breast or bottle at the point of satiety.....	89	95	8	28	97	79
b. *Scheduled Time Period.* And apparently through within time allowed.	1	1	0	0	1	1
c. *Scheduled Time Period.* Withdrawal before time allowed but "held" to breast or bottle until end of period	3	3	0	0	3	2
2. *Spontaneous withdrawal "Unsatisfactory."*						
a. *Spontaneous withdrawal too quickly* attributed to excessive flow of milk	0	0	6	21	6	5
b. *Spontaneous withdrawal, apparently unsatisfied.* Early period of difficulty in getting milk from breast, 3 cases; crying after each breast feeding, attributed to lack of milk, 1 case; through with bottle (of protein milk) but apparently still hungry, 1 case,....	0	0	5	18	5	4
B. *Forced Withdrawal.* Pulled away from breast or bottle at termination of assigned period of time.....	1	1	7	25	8	7
C. *Early Period of Feeding by Dropper only.* (In 1st two weeks) (1) or unknown (1)	0	0	2	8	2	2
Total	94	100	28	100	122	100

TABLE II.

Duration of Feeding Period.

	Non finger suckers.		Finger suckers.		Total.	
	No. of children.	Per cent.	No. of children.	Per cent.	No.	Per cent.
1. Estimated.						
5- 9 minutes	0	6	1	18	11	9
10-14 minutes	6		4			
15-19 minutes	10	12	0	0	11	9
20-25 minutes	1		0			
2. Timed.						
5 minutes	0	6	2	18	11	9
10 minutes	3		3			
10-14 minutes	3					
15 minutes	2	14	1	18	18	15
20 minutes	11		4			
3. Untimed, not estimated	58	62	7	25	65	53
4. Through "very quickly"	0	0	6	21	6	5
Total	94	100	28	100	122	100

TABLE II (CONDENSED).

1. Estimated or timed, less than 15 minutes	12	12	10	36	22	18
2. Estimated or timed, 15 minutes or longer	24	26	5	18	29	24
3. Untimed, not estimated	58	62	7	25	65	53
4. Through "very quickly"	0	0	6	21	6	5
Total	94	100	28	100	122	100

Where the duration of the feeding period is changed (usually after the first two months) the shortest duration is selected for this table.

The word "timed" as used in this table means that the duration of feeding was observed by the clock. In Tables I and II it is used in the usual "pediatric" sense; *i. e.*, feeding limited to a specified time period.

longer than fifteen minutes. The former group yielded 10 or 45 per cent fingersuckers; the latter, 5 or 17 per cent. All the feedings described as "through very quickly" or estimated or observed as five minutes or less (nine cases) are in the fingersucking group.

Pacifiers.—Artificial pacifiers were used by eight children, all in the non-thumbsucking group. This agrees with the experience of Lindner in the article cited. The breast or a toy was used as pacifier in 10 cases and these were also in the non-sucking group;

TABLE III.

TYPE OF FEEDING, PACIFIERS, NIGHT FEEDING.

	Non-fingersuckers.		Fingersuckers.	
Type of Feeding.	No. of children.	Per cent.	No. of children.	Per cent.
Breast exclusively (1st 8 mo.)....	60	63	17	61
Bottle exclusively (1st 8 mo.).....	8	8	2	7
Breast, then bottle or mixed (1st 8 mo.)	26	29	9	32
Total	94	100	28	100
Pacifiers.				
Artificial pacifiers	8	9	0	0
Breast or toys used as pacifiers....	10	11	0	0
Total	18	20	...	...
Night Feedings.				
None	7	7	2	7
One	41	44	19	68
More than one.....	39	41	4	14
No record	7	8	3	11
Total	94	100	28	100

chewing of objects at any time and pacifiers used after onset of fingersucking were not included. Information of this type, however, is difficult to secure as previously noted. We would expect, in view of the facts already known, that children using pacifiers are less likely to be thumbsuckers. The pacifier habit itself is a problem of another sort and will not be considered in this paper. The waterbottle might also be included here. This information could not be secured in a sufficient number of cases to make tabulation worth while. Where the facts are known, they are included

under "Feeding Schedule." Some mothers feed water to children between feedings from a spoon, other use regular bottles with nipple. Where the latter are used they would offer more sucking movements. Unfortunately, the data on this item are incomplete.

TABLE IV.

ONSET AND FREQUENCY.

Onset of fingersucking.	No. cases unselected group[1].	No. cases private and dispensary cases in this report.	Miss Hall's series[2].
First month	13	9	16
Second month	2	3	5
Third month	3	1	7
Fourth month	1	1	5
Fifth month	1	0	8
Sixth month	4	0	4
Seventh month	0	0	2
Eighth month	0	0	0
Ninth month	1	0	2
Tenth month	0	0	1
No record or undetermined	3	0	10
Total	28	14	60

Frequency of fingersucking.	Type of feeding.	Total cases.	Percentage of fingersuckers.
Hall (Chicago, 1926-27)	Four-hour schedule, no pacifier, timed feeding	100	40.0
Lindner (Budapest, 1879)	Probably unscheduled feeding	500	6.4
Our Series (1926)	Partly scheduled and unscheduled (all cases)	112	25.4
Our Series (1926)	Four-hour schedule, (cases only)	26	34.3

[1] Where onset is stated as, for example, at probably six months but not earlier than fourth month, it is taken as fifth.
[2] Includes all types of suckers. See footnote No. 10.

Water bottles are recorded in 10 to 49 families in the non-fingersucking group; in five of the 17 families of the fingersucking group.

Night Feedings.—There appears in the non-thumbsucking group a larger number of frequent (2) night feedings. The contrast is not large enough, it seems to me, to be significant for this series.

It is significant, however, that so far all contrasts are in favor of greater lip movements for the non-fingersuckers in regard to time at the breast, frequency of feeding and night feedings. Even in the few instances where artificial pacifiers were used they were all in the non-thumbsucking group. The actual number of feedings per day could not be secured for this series.

Type of Feeding.—The type of feeding, whether breast or bottle or mixed, has no influence on the development of fingersucking. This distribution of types of feeding is the same in both groups. This is also in agreement with Lindner's findings and Miss Hall's. The data of Miss Hall's findings on a group of 100 infants are cited in detail in the footnote No. 10.

Onset of Thumbsucking.—The vast majority of sucking cases in the unselected series began before the sixth month. When there is an excessively flowing breast, the onset of sucking is usually in the first few weeks. The other dates of onset coincide chiefly with changes in the feeding method. It is striking that there are no cases of fingersucking occurring after weaning in this series and none that are in relation to teething. However, such cases might be found in a larger series.

Sex.—Lindner, as also Miss Hill, found that there is no sex differentiation in these habits. The question was not considered in this list.

Frequency of Fingersucking.—The frequency of fingersucking is 25 per cent of our series. For contrast with other groups see note.[10]

[10] Through the kindness of Miss Dorothy Hall, psychiatric social worker at the Infant Welfare Society of Chicago, we are able to add the following information regarding a group of one hundred colored babies, age span, three weeks to two years.

This group consisted of neighborhood babies whose mothers came to the Infant Welfare Station for advice on feeding. Of this group, 68 were breast fed; 18, breast and bottle; 7, bottle only. The entire group was on a four-hour schedule. Forty were thumb or fingersuckers (18 males and 22 females). For date of onset, Miss Hall has not differentiated fingersuckers from other forms (fists, tongue, pacifier, handbiters). The majority (about 56 per cent) of all types of pleasure-suckers, began the habit in the first two months of life. Ten per cent began after the sixth month.

In a second "unselected" list of 100 white children, ages two to six, there were but five thumb or fingersuckers. Since this was also an "Infant Welfare Group," we may assume that the larger number of thumbsuckers are cured of the habit in some way or other by the second or third year.

Social Status.—It has been shown by Lindner, and is in agreement with our findings that there is no relation of this habit with the social status of the family.

Coddling.—Linder found no relation between thumbsucking and children who were the oldest or the only child of the family, or coddling. This is borne out also by our records.

In the 49 families free from fingersucking (Series I) 23 or 51 per cent have an "only child"; in the 19 families containing one or more fingersuckers per family (Series II) 8 or 42 per cent have an "only child." Within Series II the fingersuckers are distributed by chronologic position within the family group as follows:

	No. of instances.
Oldest child of the family (single instance in family)	3
Youngest child of the family (single instance in family)	4
Single child	8

In two families of four children each, all were fingersuckers.

Various theories have arisen in regard to the etiology of thumbsucking. The analysts have been especially interested in this performance; in fact, Freud's ideas of erogenic zones and his basic theory of infantile sexuality [11, 12, 13, 14, 15] are derived from his ideas of

The greater frequency of thumbsucking in this list would, on the basis of the facts enumerated, be related to the four-hour schedule and the timed feeding. In Lindner's group of 500 unselected children studied in 1879, but 13.8 per cent had the sucking habit. In his series, 26 were thumbsuckers, 6 fingersuckers, making a total of but 32 or 6.4 per cent. Lindner's group were rather old as compared with either Miss Hall's series or my own, hence instances of thumbsucking were less likely to be remembered. The striking contrast, however, may possibly be due to the fact that in Lindner's group feeding was very likely unscheduled. The unselected series of this report (partly scheduled) would then come midway between Lindner's and Miss Hall's group (frequency 25.4 per cent). Selecting from our list children who were at some time or other on a four-hour schedule we have 9 fingersuckers out of a group of 26 children (34.3 per cent). Of these only three were on a timed duration.

[11] Freud, S., "Three Contributions to the Theory of Sex," Nervous and Mental Disease Publications, New York, 1920, p. 42.

[12] Freud, S., "Collected Papers," Vol. III, p. 62, Hogarth's Press, London, 1925.

[13] Rank, Otto, Psychoanalytic Review, 13, 129, April, 1926.

[14] Kierman, J. G., "Thumbsucking as an Auto-Erotic Phenomena," Pediatrics 23, 197, 1911.

[15] Obendorf, C. P., "Emotional Life of a Child," Medical Record, 92, 6, 10, 1917.

thumbsucking. Some regard the habit as "neuropathic,"[16, 17] some as a fault in metabolism or anomaly of bone.[18] These theories and others will be considered in a later paper.

Of special interest in connection with our finding is a reference by Compayré[19] to an article by Dr. Horace Bianchon, published in a Paris daily paper ("Causerie Medicale," *Journal le Temps* for February 23, 1891) who affirms "that the new-born child measures his degree of satiety not by the quantity of milk that he has absorbed but by the sensation of fatigue which sucking produces; when he has made the movements with his lips for a few minutes, he believes that he is satisfied, even though very little milk has come. Many bad nurses deceive themselves in this way."[20]

Treatment.—It follows from the facts noted that the rational treatment of fingersucking is prophylactic; the use of methods to insure sufficient action of the lips during feeding.

Summary and Conclusion.

1. The most frequent cause of infantile finger and thumbsucking in our series is insufficient lip movements; *i. e.*, incompleteness of the sucking phase of the feeding act.

2. Of 112 "unselected" infants and children, the 28 fingersuckers in contrast with the rest have less opportunity for sucking movements. In the fingersucking group the following conditions appear with much greater frequency than for the others:

(a) Spontaneous withdrawal from a too rapidly flowing breast or bottle.

[16] Oppenheim, H., "Ueber d. ersten Zeichen der Nervösität des Kindesalters," Die Kinderfschler v. 9, 4, 1903.

[17] Stier, E., "Abgrenzung u. Begriff des Neuropathischer Kindes," Deutsche Med. Wochenschrift, July, 1915.

[18] Blanton & Blanton, "Child Guidance," Century Company, New York, 1927, p. 35.

[19] Compayré, G., "Intellectual and Moral Development of a Child," Appleton Co., New York, 1896, p. 81.

[20] It would be interesting to experiment with young animals in which the conditions for feeding and sucking movements could be well controlled. With incomplete sucking movements we might expect some habit attesting to the insufficient sucking time. Prof. A. J. Carlson, of the University of Chicago, informs me that calves who for some reason or other are not allowed to suck at the udder but must be fed from the "bucket" develop the habit of nibbling the ears of other calves.

(b) Forced withdrawal from sucking at the termination of a set period of time, shorter than for the others.

(c) Changing feeding schedules with increasing intervals between feedings and diminished duration of the feeding time.

3. Of relatively greater frequency in the "negative" or non-fingersucking group were the following conditions:

(a) Unscheduled, untimed feedings.

(b) Frequent though scheduled feedings.

(c) Frequent night feedings.

(d) Pacifiers.

4. Insufficient food appeared as a sole factor in the development of fingersucking in relatively few cases.

5. The date of onset of thumbsucking follows closely the onset of lip-sucking insufficiency; *i. e.*, where present from birth as in a too rapidly flowing breast it starts within the first few weeks of life; where forced withdrawal from feeding occurs, it starts shortly after that condition.

7. In each case of a private and dispensary series of fingersuckers, insufficiency of lip-sucking was found.

8. A comparison of groups within our series and with others shows a greater frequency of thumbsucking in infants on a four-hour schedule than on more frequent schedules.

9. It may be theoretically inferred from the facts enumerated that the severity of the fingersucking habit is in proportion to the insufficiency of sucking-time.

10. There is no relation of fingersucking to the type of feeding; breast, bottle or mixed.

11. Fingersucking occurs in twenty-five (25%) per cent of our "unselected" series; in thirty-four (34%) of our group of infants on a four-hour schedule; in forty (40%) per cent of a group of 100 colored babies on a four-hour schedule.

12. In the majority of 82 infants the onset of fingersucking was in the first five months of life.

13. There is apparently no relation to the origin of the habit of coddling, of the ordinal position of the child in the family, or of being an only child.

14. Movements associated with thumbsucking, "accessory movements," can often be traced to the movements of the hands and fingers during the feeding act.

15. Certain case-studies suggest the possibility that the specific thumb selected for sucking is of the hand that makes free movements in the first position at the breast feeding, the other hand (the locked hand) making the accessory movements.

16. The larger number of accessory movements are limited to finger manipulation of parts of head and neck, consistent with the usual range of finger movements in the first five months of life and of movements at the breast.

17. Handling of the genitals occurs as an accessory movement in a small number of cases and it may be derived as a "change in the point of interest" (Lindner).

18. Handling of the genitals by infants most likely occurs much more frequently than fingersucking and is therefore not derived from that source in the form of "accessory movement."

19. In certain cases so called "accessory movements" occur without the presence of a sucking habit. They are independent movements and may explain the origin of numerous finger-play movements in the adult.

20. In certain cases lip and tongue-sucking appear to be related to excessive sucking of the breast.

21. Fingersucking occurs without "accessory movements" in many cases.

22. In a few cases nail-biting appears to develop out of thumbsucking as a modified (partially corrected) form.

23. In one case it appeared that fingersucking developed out of thumbsucking as a partially corrected form.

24. Certain cases seem to indicate that deformity of the mouth depends on the direction and pressure exerted by the sucked finger besides the frequency of the act; where sucking has its action primarily on the finger itself, the deformity does not occur whether or not rickets is present.

25. There is no deformity of the mouth in the majority of fingersuckers.

26. It follows from the facts noted that the rational treatment of fingersucking is prophylactic; the use of methods to insure sufficient action of the lips during feeding.

BLOOD CHEMICAL CHANGES IN THE TOXIC PSYCHOSES.*

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Before considering such changes as those suggested by the foregoing title, it will be well to consider briefly the toxic-infectious group of psychoses. These psychoses are thought to be due to certain infectious diseases, states of exhaustion from any cause, alcohol and other known toxins, and certain unknown toxins arising from disordered metabolism such as occurs in uremia and the nephritides.

The symptomatology of this group of psychoses is not varied. For quite a while Kraepelin maintained a one to one relationship between the cause and the psychotic symptoms. Bonhoeffer [1] opposed this view claiming that the toxin, whatever its nature, manifested its symptoms through the brain, and as this organ necessarily showed a limited range of symptoms, therefore a toxic psychosis would not yield a varied symptomatology regardless of its cause. The chief symptoms of these acute forms, according to Bonhoeffer, are delirium, epileptiform excitements, dazed and stuporous conditions, and acute hallucinatory catatonic and incoherent amentia. Korsakoff-like reactions and personality changes of various trends, chiefly schizoid and paranoid, are the psychotic symptoms which follow in the wake of the acute toxic insanities and characterize the chronic forms.

Etiology.

Practically every acute infectious disease has been charged with producing a toxic psychosis. Furthermore, such conditions as uremia, diabetes, and heart disease have also been assigned causative rôles in this connection. Bleuler [2] states that kidney disease is often the basis of amentia. Kraepelin includes uremia among the acute toxemias. Bleuler [3] points out that some persons develop psychotic character changes with hallucinations, schizoid and para-

* Read at the eighty-third annual meeting of The American Psychiatric Association, Cincinnati, Ohio, May 31, June 1, 2, 3, 1927.

noid trends after prolonged infection followed by states of exhaustion. He further states that the prognosis is bad in such cases. W. A. White[4] points out that in chronic uremia one finds marked mental symptoms, such as stupidity, sleepiness, and euphoria. He also states that uremic psychoses may be closely related to schizophrenia in their symptomatology. They may show negativism, incoherence, and catatonia.

Classification.

The following classification is modified from White, Bleuler, and Bonhoeffer:

1. Infectious deliria. May occur before, during, or after fever.

2. Post febrile psychoses. Probably due to toxemia plus exhaustion. Symptoms show catatonia, schizoid and paranoid trends, depression, and at times Korsakoff-like reactions.

3. Exhaustion psychoses. Symptoms are schizoid, paranoid, and depressed trends. At times Korsakoff-like reactions.

4. Amentia, acute hallucinatory confusion.

5. Psychoses produced directly or indirectly by drugs. In this group there is evidence to the effect that the psychosis in question is not due to the drug itself but is due to a metatoxin which originates in the disordered metabolism produced by the drug. The drugs in question are alcohol, opium, cocaine, veronal and allied drugs, bromides, carbon monoxide, lead, and mercury.

6. Uremic psychoses. Symptoms are headache, stupidity, somnolence, euphoria, catatonic symptoms, schizophrenic states.

7. Diabetes mellitus.

8. Gastro-intestinal conditions, characterized by acute hallucinatory confusion, diarrhea, indicanuria, albuminuria, vomiting, and fever.

9. Acute delirium, characterized by sudden onset of acute hallucinatory confusion, great restlessness, perhaps symptoms resembling maniacal excitement, rapid exhaustion, coma, and death. We believe uremia to be at the basis of many of these states.[5]

10. Pellagra.

In 1922, Dr. Aurelia McIntyre and I became interested in the rôle played by the toxic factors in the genesis of mental disease. We began a survey which has continued since that time. This con-

sisted in a diligent search for accepted clinical signs of toxemia in all cases of mental disease coming under our observation, paying particular attention to such symptoms as fever, delirium, somnolent and comatose conditions, increased intracranial pressure, leukocytosis, indicanuria, albuminuria with casts, retention of waste products in the blood, lowered alkali reserve, together with the notation of an increased protein content in the spinal fluid, which last we believe to be an important finding in some forms of the toxic psychoses. Our method of approach was to subject each patient coming under our observation to as complete a physical, psychiatric, and laboratory procedure as possible. Dr. A. P. McIntyre supervised the bio-chemical and other laboratory procedures, assisted by R. J. Norris of the Cellular Research Department of the University of Cincinnati. Dr. H. D. McIntyre personally examined this group of patients and is responsible for the physical and psychiatric diagnoses as well as the correlation of results thus far obtained.

We soon found that the toxic infectious group of psychoses yielded the richest findings in a search of this kind and it is this group of psychoses which will be dealt with in this paper. However, we obtained valuable information as to the rôle of toxic factors in precipitating manic depressive and schizoid " shifts." This data will be dealt with in a later paper.

To date we have examined over sixteen hundred cases, beginning at the Sawyer Sanatorium in 1922, continuing at Longview Hospital while Dr. H. D. McIntyre was medical director of that institution as well as at the Neuro-psychiatric Service of the Cincinnati General Hospital, and finally in the private practice of Dr. Hoppe and Dr. McIntyre. With such services our opportunities for examination of cases in the acute stages were excellent.

In hospital work all of our laboratory examinations are begun on the day of admission and most are completed the following day. The patients are given only water and after a 10- to 12-hour fast without medication of any kind the specimens of blood for examination are taken. All departures from the normal are checked after an overnight fast. It is very important that blood chemical examinations be made early as the diet and medication, especially cathartics and hydro-therapeutic procedures tend to modify the blood chemical findings.

Our blood chemical examination originally included a quantitative determination of the non-protein nitrogen, urea nitrogen, uric acid, creatinin, and sugar, together with a determination of the carbon dioxide combining power of plasma. We soon found that the urea nitrogen and the CO_2 combining power of plasma yielded the most valuable information as far as our work was concerned.

In this paper we invite particular attention to the urea nitrogen of the blood and to the CO_2 combining power of the plasma. To a less extent we will consider the leukocyte count, the uric acid and creatinin of the blood.

Before considering the results of our examinations in patients, it might be well to review briefly the significance of the blood of urea, uric acid, creatinin, as well as that of the CO_2 combining power of the plasma.

Urea is one of the end products of protein metabolism. All proteins are in the process of digestion broken down into amino acids, all of which contain an $-NH_2$ radical and a COOH radical. The amino acids lose the $-NH_2$ radical in the process of deaminization. The $-NH_2$ combines with carbonic acid of the blood forming ammonium carbonate which in turn, by loss of two molecules of water, is converted into urea. This conversion, which is essentially a detoxication process (as ammonia is highly toxic), takes place in the liver. The urea, which is an innocuous substance, is excreted in the urine. The concentration of the urea in the blood in health is fairly constant.

Uric acid is the end product of the metabolism of the nucleoproteins. The metabolism of nucleic acid varies widely in various animals but in man the end product of the nuclear metabolism seems to be largely uric acid.

Creatinin is an end product of the endogenous protein metabolism—that is, of the waste of the protein tissues of the body.

Urea, uric acid, and creatinin are present in fairly constant concentration in the blood of healthy persons. They are excreted by the kidney and an increase above their normal concentration in the blood is looked on as indicating an impairment of kidney function. As renal insufficiency develops uric acid is first retained, in a later stage urea, and in the final stage creatinin. Whenever the creatinin

concentration in the blood rises above five milligrams in a hundred cubic centimeters of blood in a case of chronic kidney involvement, the prognosis is bad, usually death within a year—although in acute nephritis higher values may be obtained and recovery still take place.

Uric acid is increased in gout and certain types of systemic intoxication. It has been our experience that certain mental cases are subject to transient states of systemic intoxication in which uric acid and urea are both increased in the blood without the kidneys showing other signs of involvement, such as albumin, casts, and so forth.

From the clinical standpoint the determination of the urea nitrogen of the blood is the most practical and valuable examination as far as the nitrogenous elements of the blood is concerned, and we employ it (as well as the CO_2 and sugar determinations) as a routine examination on all patients admitted to our examination.

Retention of urea is now looked upon as evidence of renal insufficiency. While we know more of its value in nephritis than in other diseases, we are learning that retention of urea occurs in many conditions, for example: intestinal obstruction, diseases of the prostate, pneumonia, toxemias of pregnancy, cardiac diseases, uremia, and many other apparently unrelated conditions which may or may not be accompanied by what we are pleased to call nephritis. The matter resolves itself to this, that any systemic toxemia, whatever its source, which either temporarily or permanently impairs kidney function evidences itself by urea retention in the blood. Urea nitrogen determinations then can be used as a means whereby to measure certain systemic intoxications.

Let us now consider the CO_2 combining power of the blood plasma. If an acid or alkali be added to distilled water or a solution of a neutral salt such as sodium chloride, a change in the hydrogen concentration will result, depending on the amount and kind of acid or alkali added. The blood, however, possesses a remarkable property of being able to withstand the addition of considerable amounts of acid or alkali without change in the hydrogen ion concentration. L. J. Henderson has elucidated the reasons underlying this property of the blood. This ability to neutralize acids or alkalies is due in large part to a play between acids and alkalies on the one hand

and mono- and di-basic salts on the other. The fundamental equations are:

$$M_2HPO - HA = MH_2PO_4 - MA$$

and

$$MHCO_3 - HA = H_2CO_3 - MA$$

M = a basic radical and A an acid radical in the above. Such salts as $NaHCO_3$ and Na_2HPO_4 are known as buffer salts.

When an acid is produced abnormally in the body, say, for example, diacetic acid, the body has several mechanisms for neutralizing it:

1. The buffer of the blood seconded by those of the rest of the body partially neutralizes the acid. Thus the bicarbonate of the blood is broken up by the acid with the formation of carbonic acid and the neutral salt of the acid.

2. Weak acids like carbonic and phosphoric possess the unusual property of maintaining the reaction constant when they are present in a solution which contains an excess of their salts. The plasma contains much $NaHCO_3$ and it also contains H_2CO_3. The hydrogen ion concentration is proportional to the ratio $\frac{H_2CO_3}{NaHCO_3}$

Now if acid is added to the blood the Na of the denominator is used to neutralize it. The neutral salt is excreted by the kidneys but the H_2CO_3 of the blood is increased and the $\frac{H_2CO_3}{NaHCO_3}$ ratio is disturbed. As the hydrogen ion concentration is proportional to this ratio, either it must change or the H_2CO_3 must be eliminated. This latter alternative is accomplished by an increased activity of the respiratory center, which is very susceptible to changes in the CO_2 of the blood. The rate of respiration increases and the lungs accelerate their rate of CO_2 excretion until a new balance is reached where the hydrogen ion concentration is proportional to the ratio $\frac{H_2CO_3}{NaHCO_3}$ As a result of all the above, however, the bicarbonate is decreased and any material decrease is a sure sign that an acidosis is present.

3. The kidneys excrete acid products.

4. Phosphoric acid is eliminated by way of the intestine.

5. The organism forms NH_3 which reacts with the acid present. Hence, the ammonium carbonate instead of being converted into

urea in the liver is used as an alkali reserve, and resulting ammonium salts are excreted in the urine. Normally, only 5 per cent of the nitrogen of the urine is in the form of ammonium salts but during acid intoxication the percentage of ammonium salts rises while that of the urea falls.

From the foregoing, we see that: the bicarbonate content of the blood is a criterion of the acid-base metabolism of the blood and probably of the body fluids in general. The bicarbonate is the excess of base left over after all fixed acids are neutralized. It represents the base available for the neutralization of any acids which may appear, in other words, it represents a measure of the alkaline reserve. Van Slyke defines acidosis as "a condition in which the concentration of bicarbonate in the blood is reduced below the normal level." If the respiratory center for any reason does not respond promptly enough to an increase in the molecular ratio $\frac{H_2CO_3}{NaHCO_3}$ and the hydrogen concentration becomes greater, the condition is known as uncompensated acidosis. If the center responds, eliminating the H_2CO_3 excess, the hydrogen ion concentration is held normal although the $NaHCO_3$ is decreased, and this latter condition is compensated acidosis.

Clinically, the determination of the CO_2 combining power is not so conclusive as is that of the urea nitrogen of the blood because it is subject to more variables than is the urea nitrogen. However, in certain cases, the determination of the CO_2 combining power of plasma is of great value both as diagnosis, prognosis, and as a guide to treatment. Certain facts have emerged.

Mild acid intoxications are extremely frequent in patients admitted to our service. These can easily be explained on the basis of:

(a) Muscular exertion with fatigue.

(b) Excitement with fatigue.

(c) Starvation in that in his excited mental condition the patient does not eat regularly.

Nearly all toxic psychoses show a marked depletion of the CO_2 combining power usually with urea retention. There are several explanations:

(a) Excitement with fatigue.

(b) Impairment of kidney function by the toxin causing the psychosis with a resulting failure of the kidney to excrete the acids of normal metabolism.

(c) The toxin produced may be an acid and its presence in the blood will lower the alkali reserve. This is certainly true in those cases in which a brilliant therapeutic result is obtained by giving alkali.

Normal Values.

The normal values for urea, uric acid, and CO_2 combining power of plasma lie within the following limits:

Urea nitrogen, 11 to 15 milligrams per 100 c. c. of whole blood.

Uric acid, 8/10 to 3 milligrams per 100 c. c. of whole blood.

CO_2 combining power of plasma, 55 to 77 c. c. reduced to 0°C., 760 mm. pressure, bound as bicarbonates by 100 c. c. of plasma in adults. We consider as pathological:

Urea nitrogen, 20 milligrams or more per 100 c. c. of whole blood.

Uric acid, 4 milligrams or more per 100 c. c. of whole blood.

We employ Folin's system of blood analysis for urea nitrogen, dextrose, uric acid, and so forth. We employ the method of Van Slyke and Cullen for the determination of the alkali reserve.

So much for the methods and the significance of the data with which we are dealing. Let us now consider clinical cases.

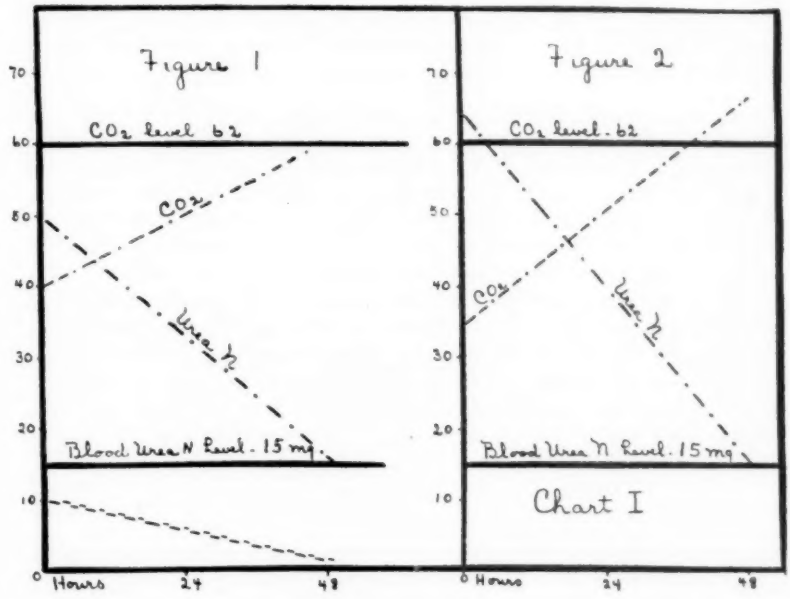
Case Reports.

Case 1.—Post febrile psychosis. The patient, a female, age thirty-three years, was admitted to the hospital in a state of acute hallucinatory confusion. She was not well oriented for time or place; she was euphoric and obscene; she sang and shouted a great deal, was restless and excited and had to be restrained. She had hallucinations both of sight and hearing. Her appendix had been removed two weeks before admission. Her tonsils had also been removed shortly before admission. Her blood chemical examination is tabulated as follows:

Time	Urea nitrogen	Uric acid	CO_2
Admission	50 mg.	10 mg.	40 c. c.
48 hours	15 mg.	1.5 mg.	62 c. c.

On admission she showed evidence of nitrogen retention, the urea nitrogen being fifty milligrams. The uric acid likewise was elevated as is common in cases of nitrogen retention. She also showed evidence of acid intoxication as the CO_2 combining power of the plasma was forty-four. The urine examination disclosed large amounts of acetone, diacetic acid, and indican.

Her treatment consisted of bed rest, Fischer's solution per rectum, plenty of fluids, including a milk diet. A second blood chemical examination, forty-eight hours later, showed normal findings—urea nitrogen of fifteen milligrams, uric acid of 1.5 milligrams, and CO_2 combining power of sixty-two. Coincident with the improvement in the toxic condition there was a striking improvement in the mental symptoms. The patient had become normal mentally. From the standpoint of descriptive psychiatry, the diagnosis in this case would have been that of acute delirious mania. From the blood chemical standpoint, however, we were dealing with an acute toxic psychosis of unknown origin, characterized by nitrogen retention and acidosis. Treatment



directed toward this condition brought about complete mental recovery. There has been no recurrence of the trouble since two years (see Chart 1, Fig. 1).

CASE 2.—Amentia. The patient, a female aged twenty-one years, was admitted to the hospital February 28, 1924, in a state of acute hallucinatory confusion. The onset had been sudden one week before admission. The patient was not oriented for time or place. She showed echolalia and perseveration to a marked degree. She had hallucinations of hearing and her general mental content was decidedly manic in trend. She had been delivered of a baby five months before and had nursed this child until a week prior to admission. She had been subject to attacks of grand mal since childhood although she had never shown any psychotic attacks until the

present one. She was of average intelligence although her education had been neglected as she had not attended school regularly on account of her epileptic attacks. The physical examination was negative as far as gross findings were concerned. Laboratory examination disclosed a polymorphonuclear leukocytosis together with the following blood chemical examination as shown in the accompanying tabulation:

Time	Urea nitrogen	CO_2
Admission	64 mg.	35 c. c.
48 hours	15 mg.	66 c. c.

Her treatment consisted of administration of alkali, elimination consisting of dehydration, hot packs and continuous baths. On March 4, she was well mentally. She remained in the hospital until April 4, 1924, when she was sent home on trial visit and discharged from the out-patient clinic a year later with no recurrence of her psychosis (see Chart 1, Fig. 2).

CASE 3.—Amentia. The patient, a young man aged twenty-five, was admitted to the hospital October 30, 1924, in a state of acute hallucinatory confusion. History obtained from relatives disclosed the following: The patient had recently come from Germany to America. He was an electrician and had worked as a technical assistant in several physio-chemical and X-ray laboratories in Berlin. He was married, had a negative personal and family history as far as nervous and mental disease are concerned. His attack of confusion had been ushered in by a mild depression to which little attention was paid by his relatives as they ascribed his depression to nostalgia. At the time of admission the patient was greatly confused and had hallucinations of hearing. His physical findings at the time of admission showed a generalized twitching of the muscles such as is seen in impending uremia. The blood chemistry is shown in the accompanying tabulation:

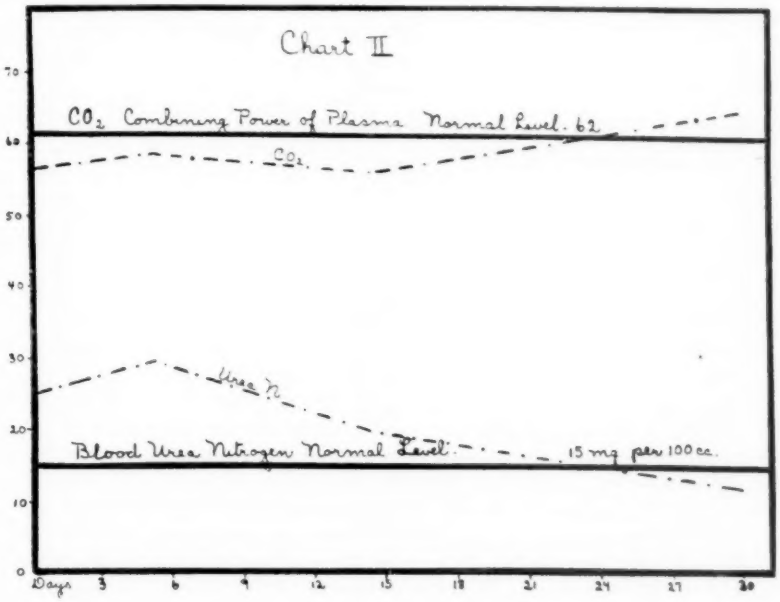
Time	Urea nitrogen	CO_2
Admission	25 mg.	56 c. c.
5th day	30 mg.	59 c. c.
14th day	20 mg.	56 c. c.
30th day	12 mg.	64 c. c.

On admission the examination of the blood chemistry disclosed nitrogen retention. Elimination by means of dehydration and hot packs restored the blood chemistry to normal on the thirtieth day after a rather severe colonic stasis was removed by enemas. By this time the patient was entirely well mentally and has remained well since (see Chart 2).

CASE 4.—Difficult to classify—probably catatonic state precipitated by infectious toxemia. The patient, a negro girl aged twenty-one years, with negative personal and family history, was admitted to the hospital April 22, 1924, in a state of pronounced catatonia with waxy flexibility and mutism. The diagnosis of catatonic dementia præcox had been made by several alienists prior to the admission. Physical examination disclosed a severe endometritis. The blood pressure was extremely low, registering 70 mm. systolic and 50 mm. diastolic. Daily observations of the blood pressure showed that

it remained at this low level up to the time of her discharge one hundred and twenty days later when it had risen to 90 mm. systolic and 60 mm. diastolic. The laboratory examination on admission revealed a polymorphonuclear leukocytosis of nineteen thousand and a urea nitrogen of twenty-three milligrams. The results are shown in the accompanying table:

Time	Leukocytes	Urea nitrogen	Blood pressure	
Admission	19,000	23 mg.	70 systolic	50 diastolic
120th day	6,000	12 mg.	90 systolic	60 diastolic



Treatment was directed toward the infected pelvic condition and the patient was given a long course of hydrotherapy. She was sent out on trial visit on the one hundred and twentieth day mentally well. She was discharged from the out patient clinic one year later having had no recurrence of her mental trouble.

CASE 5.—Difficult to classify—probably toxic factor precipitating manic attack. The patient, a white woman aged forty-five years, was admitted to the hospital August 31, 1924, in a state of manic excitement following a threat of homicide. She had no delusions or hallucinations. She had suffered an attack of depression four years before in which she was confined in a hospital after threatening suicide. She has been subject to unusual affect fluctuation since childhood but only two of the attacks were severe enough

to warrant commitment. At no time has she shown any confusion, hallucinations, or delusions. Her physical examination was negative except for a pan hysterectomy some years before. Her blood chemical examination is shown in the accompanying table:

Time	Urea nitrogen	CO_2
Admission	30 mg.	40 c. c.
9th week	15 mg.	51 c. c.

On admission she showed evidences of nitrogen retention as well as acid intoxication. The patient recovered from her manic attack in nine weeks and with a return of her normal mentality the blood chemistry came within normal limits.

CASE 6.—Difficult to classify. The patient, a white man age fifty-five years, a building contractor, was admitted to the hospital August 1, 1922, in a state of mania. He was euphoric with grandiose delusions as to great wealth. A tentative diagnosis of paresis was made. However, the neurological examination as well as the blood and spinal fluid examination were entirely negative. He remained in a manic state for two months and recovered completely. He was returned July 26, 1924, in practically the same condition as before, a diagnosis of paresis having been made by a number of alienists. His neurological examination, blood and spinal fluid were again negative except that he had occasional attacks of divergent strabismus with double vision. At this time it was learned that before his previous attack he had had a nose operation following which he lay in a stuporous state for over two months. At the time of his physical examination he was greatly underweight. Stereoscopic plates of the skull showed a chronic ethmoid and antrum infection. At the time of his second admission his blood chemical examination showed a nitrogen retention of thirty milligrams as well as a lowering of the alkali reserve. The patient recovered from the manic attack in eleven weeks, gained greatly in weight and the blood chemistry returned to normal. The patient was sent out on trial visit January 2, 1925, and has remained well since, attending to his affairs in a capable manner.

The blood chemical examination is shown in the accompanying table:

Time	Urea nitrogen	CO_2	Body weight
Admission	31 mg.	39 c. c.	100 lbs.
8th week	18 mg.	44 c. c.	140 lbs.
11th week	16 mg.	53 c. c.	150 lbs.

Naturally we could enter into a lengthy discussion as to the diagnosis of this case as to whether it was paresis, manic-depressive insanity, or a residual manifestation of encephalitis following the nasal operation. The outcome and serological examination are decidedly against paresis.

CASE 7.—Toxic factors precipitating manic attack. The patient, a girl nineteen years, was admitted September 23, 1924, in a condition of acute mania. The attack began about a week before her admission to the hospital. On admission, the patient showed a leukocytosis of fifteen thousands, urea

nitrogen of thirty-five milligrams, CO_2 combining power of forty. She was given fluids and salt solution for three days in addition to a milk diet. On the third day, the blood examination was unchanged. Alkalies were added whereupon the CO_2 combining power rose and urea nitrogen fell to normal. A further examination, thirty-six days after admission, showed leukocytes six thousand, CO_2 combining power sixty-one, urea nitrogen fourteen milligrams per one hundred cubic centimeters. The physical condition of the patient was greatly improved but mentally she showed a state of mania not so marked as on admission, however. Her temperature during the acute phase of the attack ranged from 101° to 103° F. While this patient improved, her improvement was not so marked as in the two other cases reported.

Aside from its psychiatric interest, this case is of interest from the blood chemical standpoint. We interpret nitrogen retention in terms of kidney impairment. The cause of kidney impairment has been assigned to acid intoxication by Dr. Martin H. Fischer. Others have said that the kidney fails to excrete acids. In this case, however, the kidney functions did not improve until alkali had been added to the treatment régime. This one case at least would favor the view of Dr. Fischer, that the acidosis suppressed the kidney function which became normal after alkali had been given.

The blood chemical examinations and the leukocyte counts are shown in the following table:

Time	Urea nitrogen	CO_2	Leukocytes
Admission	35 mg.	40 c. c.	15,000
4th day	35 mg.	40 c. c.	.....
16th day	28 mg.	50 c. c.	.....
35th day	12 mg.	53 c. c.	6,000

Case 8.—Infectious toxemia precipitating manic attack. The patient, a negress, age sixty-five years, was admitted to the hospital in a maniacal attack. Four years before she had an attack of depression followed by a lucid interval, which in turn was followed by a manic attack. She was euphoric and talkative. She passed from a state of wild mania to one of delirious mania when she was admitted to the hospital.

Large quantities of green pus were pouring from the nose. The patient also coughed up large quantities of this same green pus which proved on bacteriological examination to contain large numbers of gram positive diphtheroid bacilli.

The blood chemical examination showed a nitrogen retention of twenty-five milligrams along with an acid intoxication, the CO_2 combining power being forty-four. There was also a leukocytosis of fourteen thousands.

The treatment consisted of Fischer's solution per rectum, liquid diet when the patient could be induced to take any nourishment. Forced feeding was resorted to on two occasions but was abandoned on account of the fact that the patient showed signs of circulatory collapse on both occasions.

She became steadily worse. On the eighteenth day the patient showed urea nitrogen of fifty milligrams, CO_2 combining power of forty-five, and a leukocytosis of sixteen thousands.

The rhinologist was called. He washed out both antra, obtaining a large amount of foul-smelling pus from the left antrum. Following this procedure the patient improved greatly both mentally and physically. Sixty days after admission, a blood chemical examination revealed urea nitrogen of twelve milligrams, CO_2 combining power of sixty-two, leukocytes nine thousands. The temperature which had ranged from 102° to 104° F. had returned to normal. She continued to improve physically, gained weight and was sent home mentally normal four months after admission.

From the psychiatric standpoint, this case must be considered as a manic attack in a manic-depressive patient. From the medical standpoint, we would

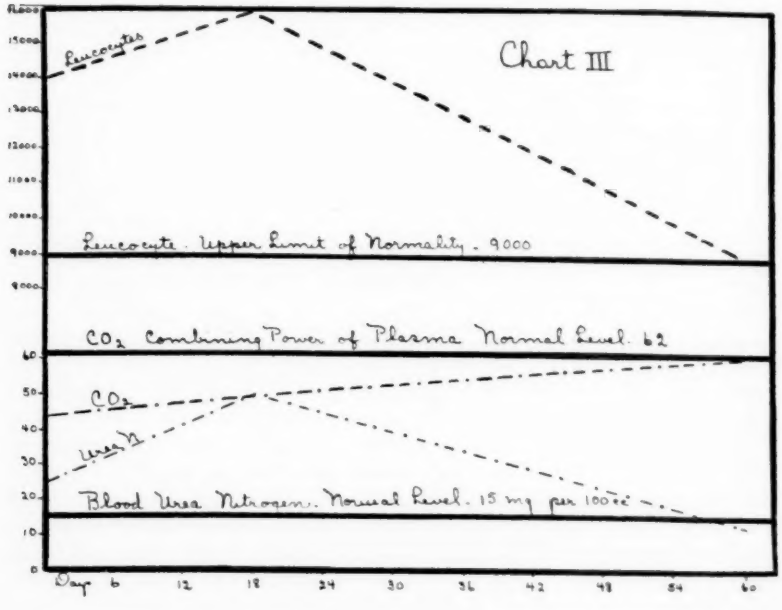


Chart III
Leucocytes
Leucocyte. Upper Limit of Normality. 9000
CO2 Combining Power of Plasma Normal Level. 62
CO2
Urea N
Blood Urea Nitrogen. Normal Level. 15 mg per 100 cc
Days 6 12 18 24 30 36 42 48 54 60

consider it as an ethmoid infection causing an acute toxic psychosis. The blood findings are shown in the accompanying table (see Chart 3):

Time	Urea nitrogen	CO_2	Leukocytes
Admission	25 mg.	44 c. c.	14,000
18th day	50 mg.	46 c. c.	16,000
60th day	12 mg.	62 c. c.	9,000

CASE 9.—Psychotic attack of manic trend precipitated by toxic factors—probably alcohol. The patient, a white man aged thirty-five years, was admitted to the hospital August 21, 1924, in a state of acute delirious mania. He was euphoric and confused and showed considerable psychomotor activity. He sang and talked a great deal, made rhymes and showed the flight of ideas and the faulty perception common to the manic phase of manic-

depressive insanity. His family and personal history were negative as to nervous or mental disease. His treatment consisted of alkali, dehydration, and hydrotherapy in the form of hot packs and continuous baths. On admission his laboratory examination disclosed nitrogen retention, acidosis, and polymorphonuclear leukocytosis. He improved greatly under treatment during the first three weeks. His confusion cleared, he became oriented and gave a clear account of himself. He stated that he had been drinking before admission. However, it is questionable as to whether or not alcohol was the cause of his symptoms.

The fourth week after admission the patient began to show considerable clouding of consciousness in which state he remained until sent out on trial visit, December 12, 1924. Since that time he has improved slowly although he still has some confusion at times. The course of the blood chemistry is shown in the following table:

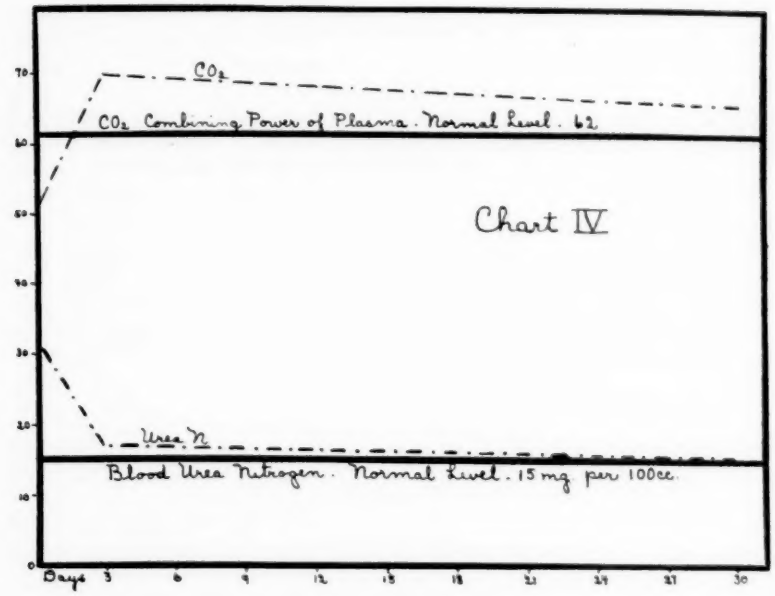
Time	Urea nitrogen	CO_2	Leukocytes
Admission	38 mg.	37 c. c.	14,000
5th day	28 mg.	59 c. c.	.....
16th day	12 mg.	57 c. c.	.....
70th day	20 mg.	58 c. c.	11,000

It is interesting to note in this case that clouding of consciousness returned accompanied by a rise in the urea nitrogen. The patient was mentally clear during the third week when the nitrogen retention disappeared for a time.

CASE 10.—Uremic psychosis. The patient, a female aged seventy-one years, was admitted to the hospital February 17, 1925, in a state of agitated depression with confusion. The onset of the mental trouble had been three months before admission. At the time of admission the blood chemical examination revealed a nitrogen retention of thirty-two milligrams together with a lowering of the alkali reserve. The urine contained two grams of albumin per liter and many granular and hyaline casts. The usual treatment of alkali, dehydration, and continuous baths was instituted and in three days the urea nitrogen came down within normal limits, the alkali reserve rose and the albumin and casts disappeared from the urine. Mentally the woman was greatly improved. Within two weeks' time she was well mentally. The course of the blood chemistry is shown in the accompanying table (see Chart 4):

Time	Urea nitrogen	CO_2
Admission	32 mg.	50 c. c.
3d day	17 mg.	70 c. c.
30th day	16 mg.	66 c. c.

This case may be interpreted as a psychosis of the depressed confusional type on the basis of an acute exacerbation of the toxemia of chronic nephritis.


CO_2
CO_2 Combining Power of Plasma. Normal Level. 62
Chart IV
Urea N.
Blood Urea Nitrogen. Normal Level. 15 mg per 100cc.
Days

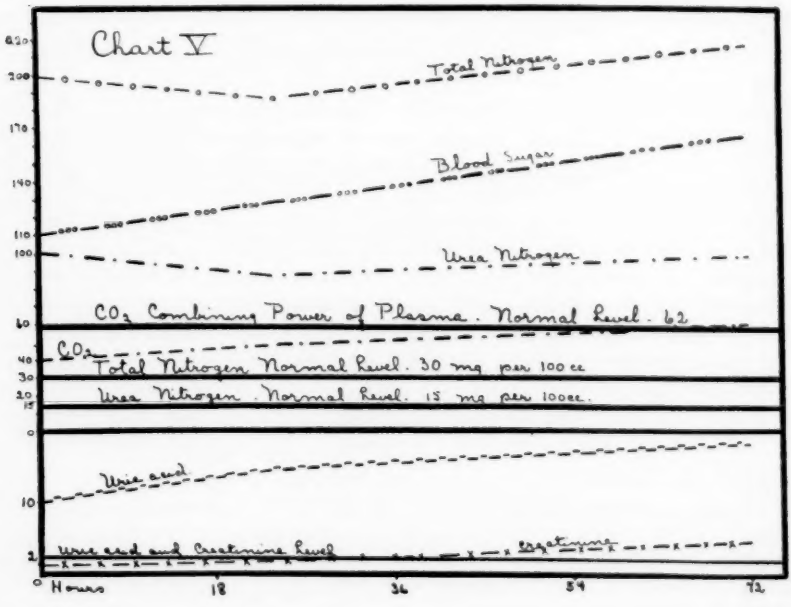


Chart V
Total Nitrogen
Blood Sugar
Urea Nitrogen
CO_2 Combining Power of Plasma. Normal Level. 62
CO_2
Total Nitrogen Normal Level. 30 mg per 100 cc
Urea Nitrogen. Normal Level. 15 mg per 100cc.
Uric acid
Uric acid and Creatinine Level
Creatinine
Hours

CASE 11.—Uremic psychosis. The patient, a negro man aged forty-five years, was admitted to the hospital November 11, 1924, in an acute delirious manic state with a history of drinking moonshine continuously for the past month. He was violent. It required four policemen to take him to the hospital. On admission his blood chemistry showed marked nitrogen retention, as well as a lowered alkali reserve. He was given alkali glucose but to no avail. The urea and total nitrogen rose steadily, as did the uric acid and creatinin. He gradually sank into a comatose condition with fibrillary twitching of muscles and he died seventy-two hours after admission.

The course of the blood chemistry is shown in the accompanying table (see Chart 5):

Time	Urea nitrogen	Total N.	Creatinin	CO_2	Sugar
Admission	...100 mg.	200 mg.	1.5 mg.	40 c. c.	110 mg.
24 hours	..... 95 mg.	190 mg.	2.5 mg.	50 c. c.	130 mg.
72 hours	.....100 mg.	220 mg.	4.5 mg.	62 c. c.	170 mg.

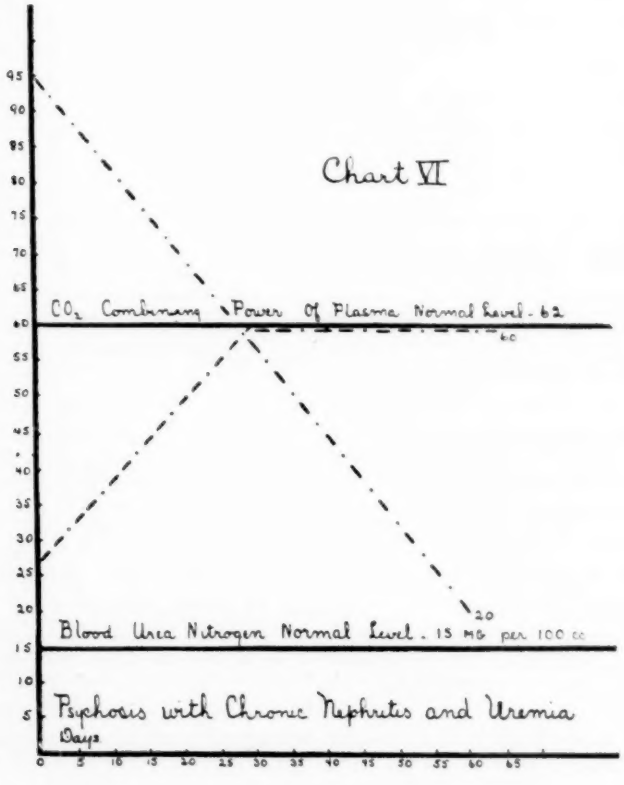
CASE 12.—Uremic psychosis. The patient, a white female aged forty-nine, was admitted August 31, 1924, in a state of acute delirious mania. She was so violent that it required four nurses to take her to the ward. History obtained from the husband disclosed that she had been depressed for three months before admission and had said on several occasions that she wanted to die. She also had mild persecutory ideas with hallucinations of hearing. One week before admission she complained of dizziness and some dimness of vision. Following this she became disturbed. At the time of admission the urine showed three-fourths gram per liter of albumin and hyaline casts. Blood chemical examination revealed urea nitrogen retention of sixty milligrams per hundred cubic centimeters, CO_2 combining power of twenty-eight. Her temperature rose to 106.6° F. and she died forty-eight hours after admission. Here we are evidently dealing with a uremic psychosis.

CASE 13.—Uremic psychosis. The patient, a white male, age sixty years, was admitted to the hospital in a state of confusion, with periods of somnolence. He showed semi-lucid intervals in which he was euphoric. The diagnosis of paresis had been made prior to admission, although the spinal fluid was negative except for a pathological excess in globulin and an increase in pressure. His blood pressure was systolic 200 mm. and diastolic 105 mm. The urine disclosed albumin, hyaline and granular casts. The blood chemical findings were (see Chart 6):

Time	Urea nitrogen	CO_2
Admission	95 mg.	28 c. c.
30th day	60 mg.	62 c. c.
60th day	60 mg.	60 c. c.

On admission the patient was given a course of hot packs, alkalies and fluids by mouth, meat was restricted. At the end of 30 days the patient's mental condition greatly improved, urea nitrogen had fallen to 60 mg., alkali reserve rose to normal and at the end of sixty days the patient was normal mentally. This case may be explained as a uremic psychosis in a patient with chronic nephritis.

CASE 14.—Uremic psychosis. The patient, a woman of forty-eight years, was admitted to the hospital in a state of deep somnolence from which she could hardly be roused. Physical examination showed both discs choked, unequal pupils, diminished deep reflexes, but otherwise a negative neurological examination. The blood pressure was 220 systolic, albumin, granular and hyaline casts in the urine, spinal puncture revealed fluid under greatly



increased pressure, more than 45 cm. of water, the fluid overflowing the manometer. The blood pressure, spinal fluid pressure, and blood chemical findings are shown in the table (see Chart 7):

Time	Urea nitrogen	CO_2	Spinal fluid pres.	Bl. pres.
Admission	48 mg.	45 c. c.	45 cm. water	220
20th day	32 mg.	51 c. c.	45 cm. water	210
35th day	20 mg.	64 c. c.	30 cm. water	180
65th day	15 mg.	64 c. c.	20 cm. water	180

The patient was treated with hot packs, alkalies, catharsis. Her somnolence became less on the 20th day. She passed into a state of confusion, with euphoria and falsification of memory and evidenced hallucinations of hearing. This state gradually improved and on the 65th day she was normal mentally and has remained well since that time.

CASE 15.—The patient, a white male, age 32 years, was first seen July 6, 1926. History disclosed that 13 weeks ago he ran a piece of sheet metal

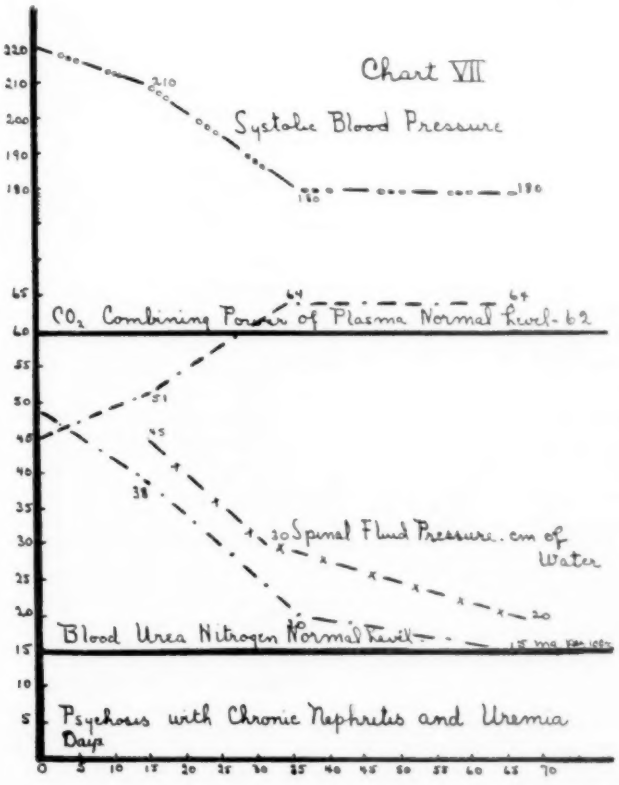
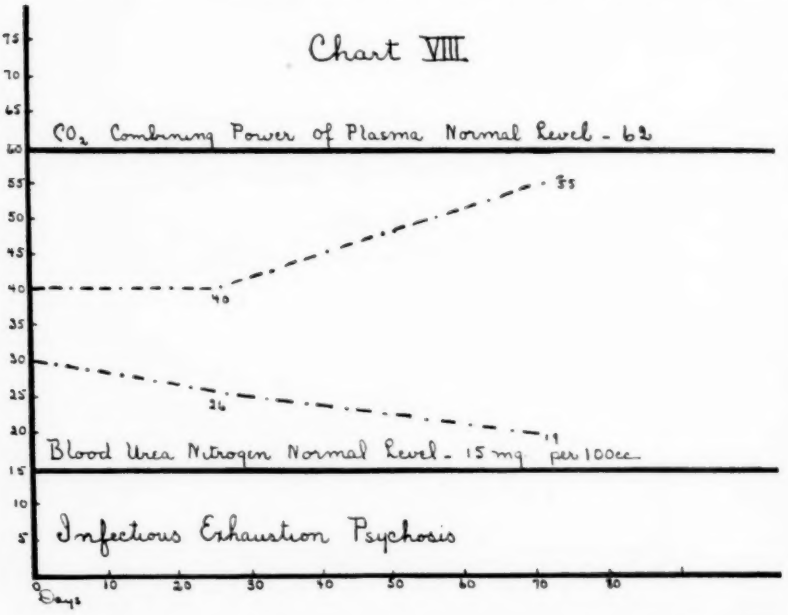


Chart VII
Systolic Blood Pressure
CO2 Combining Power of Plasma Normal level - 62
Spinal Fluid Pressure - cm of Water
Blood Urea Nitrogen Normal level
Psychosis with Chronic Nephritis and Uremia
Days

into his hand. The wound became infected. He gave a typical history of both local and general infection with red streaks running up the arm, excessive sweating and chills. Cultures from the wound showed streptococci. The patient was treated with anti-streptococcic serum, was away from work for about 6 weeks, lost weight, going from 189 pounds to 135 pounds, returned to work but was unable to continue as he developed hallucinations of hearing and became suspicious of his fellow-employees. He returned home, became very much depressed, cried a great deal and could not sleep,

became suspicious of his wife, at night thought he heard people in the house, one night he developed an idea that someone had stolen his youngest baby. He went into the room where the child was in bed and told his wife that someone had stolen the child. His wife tried to calm him but he became very much distressed and went to the bureau, secured a revolver and shot himself through the chest. He was treated at the Jewish Hospital and made a complete recovery from the bullet wound. Following his stay in the Jewish Hospital he was transferred to a private sanatorium. Here he remained until January, 1927, and during this time he had hallucinations of hearing, developed paranoid ideas toward his family and friends, had periods of confusion at times in which he was not well oriented. Most of



the time, however, he was not confused and showed no quantitative defect of intelligence. The neurological examination was negative for any localized organic findings. The urine showed a trace of albumin, blood chemical examinations disclosed evidence of nitrogen retention which persisted for some time. The family history showed no evidence of mental disease in any of the relationship. The personal history of the patient showed that he had never had any previous psychotic attacks, also that he had never shown any evidence of psychotic trends. On the night of January 18th, the patient escaped from the hospital and swallowed hydrochloric and carbolic acid. He died from the effects of this a few days later. Diagnosis: Toxic infectious exhaustion psychosis following streptococcus infection of the hand. The blood chemical findings are shown in the accompanying chart (see Chart 8).

CASE 16.—The patient, white, female, aged 44, was first seen in 1923 suffering with a slight attack of hypomania. She recovered from this in about four weeks. At that time she showed evidence of thyroid enlargement. She was next seen April 4, 1927. At this time was in a manic state, showing psycho-motor activity, evidenced by incessant conversation and flight of ideas. Physical examination showed enlargement of the thyroid, pulse rate 120, blood pressure 180 systolic, 80 diastolic. Patient weighed 132 pounds. She was seen by a surgeon who refused to operate on her thyroid, following this she was removed to the sanatorium where she became more maniacal, her maniacal state finally culminating in a delirious mania. Blood chemical examination at this time revealed urea nitrogen retention of 75 mgm. per 100 c. c. Alkali reserve 32. The patient died 48 hours later with the blood chemical findings unchanged. Diagnosis: Manic-depressive insanity complicated by an acute toxic psychosis probably on a hyperthyroid basis.

CASE 17.—The patient, white, male, age 44, history disclosed that he had been a periodic drinker for about 20 years. Had been drinking until three weeks ago. Drank 14 quarts of whiskey in two weeks' time. Chemical tests of whiskey showed traces of methyl alcohol. Two weeks ago he became totally blind; was seen by an ophthalmologist who stated that he would always be blind. However, since that time the sight has gradually improved, at the time of examination the patient can read headlines and discern objects such as hair brushes, combs, etc. During the last two weeks the family and friends have noticed a decided mental change. Mental examination: the patient is not oriented for time or place. He shows grandiose ideas and also showed defects of memory which were supplied by all sorts of fabrication. He showed the typical falsification of memory observed in Korsakoff psychosis. Physical examination: The patient showed a bilateral optic atrophy, pupils reacted to light and accommodation. The deep reflexes of arms and legs could not be obtained. There was a weakness of both arms and legs, atrophy of the small muscles of the hands. The spinal fluid was clear and not under increased pressure. The Wassermann was negative to both the ice chest and water bath method, there were no cells but the fluid showed a heavy excess of globulin. We have observed this heavy excess of globulin in other types of toxic psychoses and we consider it to be due to a degeneration of nervous tissues. Diagnosis: Toxic psychosis due to alcohol.

CASE 18.—Patient, white, female, age 63, was first seen February 12, 1927. She had been depressed for two weeks following an automobile accident in which her favorite nephew had been killed. She had never shown any evidence of delusions or hallucinations. The blood pressure was somewhat elevated, being 170 systolic, 90 dyastolic. Physical examination disclosed an upper motor neuron lesion involving the left side of the body. Babinski, Oppenheim and Chaddock sign positive on the left foot, likewise ankle clonus on the left side. The patient was diagnosed as a mild depression and was referred back to her family physician for treatment. During her stay in the hospital she became confused and disoriented, slept during the

day, awake all night. I was again called to see her and advised that she be removed to a sanatorium. She had been given rather large doses of bromide. At the sanatorium it was discovered that she had a severe colonic stasis which was removed by enemas. The blood chemical examination was normal but the patient ran a fever varying from 99 to 101 for several days. Spinal puncture was performed, the spinal fluid contained no cells, negative Wassermann, negative gold curve, but a large excess of globulin was present. This patient remained confused and showed a typical Korsakoff like reaction in the mental sphere. She would describe long automobile trips that she had taken an hour before when in reality she had not been out of bed. She would describe the scenery along the way and the hotels at which she stopped in the minutest detail. This mental state gradually cleared up and the patient eventually made a complete recovery. Her upper motor neuron lesion, of course, remained unchanged. I do not think this had anything to do with her psychotic attack but was probably secondary to arterial disease in the brain. There are two possible diagnoses in this case. The possibility of lethargic encephalitis would have to be considered but the patient showed none of the familiar signs of encephalitis such as headache, double vision or extra-pyramidal involvement. My diagnosis in this case is toxic psychosis secondary to bromide poisoning. The increased protein content in the spinal fluid can be interpreted in the same manner as the increased protein observed in Korsakoff's psychosis due to alcohol.

In the foregoing cases we see manic depressive, schizoid, and confusional attacks appear accompanied by signs of systemic toxemia in some instances and disappear *pari passu* with those signs. Some of these cases were benefited by treatment directed toward elimination of the toxemia. In other cases, although we could clear up the signs of toxemia as far as they appeared in the blood, the patients did not improve mentally.

These cases were seen late in the course of their disease and we believe that the damage to the cerebral cells by the toxemia had become irreparable; although we could clear up the toxic state by treatment, the brain cells had been damaged past the point of repair.

In this connection, I would like to call attention to the work of Dr. Martin H. Fischer on fatty degeneration, a problem which concerns every neuro-psychiatrist. In brief, Dr. Fischer considers the normal brain as a colloid-chemical emulsion of fats in a hydrated colloid, the colloid in this case being protein. The integrity of this emulsion depends on the general laws governing the behavior of such emulsion *in vitro*.

In an emulsion the fat is divided in very minute particles in the hydrated protein. These particles are so small as to be invisible by means of the ordinary microscope. The emulsion can be broken by any substance which will affect the hydrated colloid protein. If too much water be added, the colloid is diluted to the point where it will not be effective in holding the fat in the emulsion. If the colloid be de-hydrated by appropriate agents, such as alcohol or salts, it can no longer hold the fat in emulsion. Under such conditions the fat comes out of the emulsion and the small hitherto invisible particles coalesce to form larger particles which now are visible under the microscope.

Being a perfect emulsion, the normal brain under the microscope shows no visible fat particles as they are too small to be seen. However, if this emulsion be cracked or broken by any means similar to those employed in breaking emulsions *in vitro*, then the invisible fat particles come out of the emulsion and coalesce to form larger particles, the result that we have the pathological pictures of lipoid degeneration, fatty degeneration and fatty infiltration common in microscopic pathology. This colloid chemical phenomenon may explain the appearance of an excess of globulin in the spinal fluid in those toxic degenerative diseases an example of which is the disease produced by alcohol.

A common cause of this breaking of the emulsion is acid intoxication which causes some of the proteins to swell and others (the globulin) to be de-hydrated and precipitated. This combination of swelling and precipitation yields the pathological picture of cloudy swelling. If the cloudy swelling persists, it is followed by fatty degeneration and we have now reached the irreversible point of the reaction. All treatment to be effective must be instituted before this irreversible point is reached.

SUMMARY.

1. Blood chemical examinations are of great value in the study of the early stages of mental disease especially those psychoses showing any symptoms of hallucinatory confusion. They assist in the differential diagnosis of the toxic psychoses especially of those on a uremic basis. They also aid in demonstrating the rôle of toxic factors in precipitating psychotic attacks in the major psychoses.

2. Evidence is presented to show that manic-depressive, schizoid and confusional reactions may in their early stages be accompanied by signs of toxemia, viz., leukocytosis, acidosis, fever and nitrogen retention.

3. Treatment directed toward the elimination of the toxemia is frequently effective in bringing about a mental recovery.

4. The toxins, acid or otherwise, so affect the hydrated colloids of the nerve cells as to bring about a cracking of the emulsion of which the nerve cell is composed. Treatment to be effective must take place before this irreversible cracking point is reached.

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DISCUSSION.

Dr. Thos. J. Heldt (Detroit, Michigan).—Dr. McIntyre has given us data in which I am personally very much interested for the reason that the conditions of which he speaks are frequently encountered in general hospitals. We have many of these cases come to us as primary psychiatric problems and we are frequently called in consultation by the internist or the surgeon. We have come to meet them with such frequency that now our most common first diagnostic impression is: Toxic mental state probably due to dehydration.

On all patients admitted to the neuropsychiatric division of the hospital as our primary responsibility, blood chemistry is a matter of routine. Our impression that dehydration is a prominent factor is probably best deduced in considering the following: Not infrequently, a patient with a symptomatic mental depression will go for days without adequate food and drink, despite all urging on the part of the family. The patient's mental depression is so outstanding that it absorbs the attention of all those who have to do with him. Even the family physician when called, declares that the case is a mental one and that arrangements for institutionalization are in order. As the patient's fluid intake and output continues to be disregarded, an elevated temperature appears and the patient becomes "sicker." At this stage the patient is usually brought to the hospital, and accordingly, as the patient is brought directly to the division of general medicine or the division of neuropsychiatry, consultation or primary responsibility follows.

In the division of neuropsychiatry, we pursue the following mode of attack: Immediate review of all organic system, noting especially the

status of the gastro-intestinal tract, and the cardiovascular system, in order to have immediate inventory of alimentation, excretion, and cardiac reserve. If patient voluntarily cooperates, fluid intake is encouraged by mouth. If there is no cooperation, we usually resort to a thorough gastric lavage with 2 per cent sodium bicarbonate, provided, of course, there are no contra-indications. We like to leave from 100 to 200 c. c. of the sodium bicarbonate solution in the stomach. Then, in order to evaluate further the cardiac reserve, we resort to an intravenous injection of 100 to 200 c. c. of normal saline. If all goes well, we are then ready to resort to intravenous injections of glucose. We use from 100 to 500 c. c. of 5 to 10 per cent solution. Occasionally if hypertonic effect is desired, smaller amounts of 25 per cent and even 50 per cent may be used. (These hypertonic solutions are more often used in cases other than those due to dehydration.)

These procedures so briefly sketched often produce surprisingly good results. Many are similar to those given to us by Dr. McIntyre. Dr. McIntyre has called attention to important therapeutic procedures and there is much to be gained by carrying on similar studies.

DR. MCINTYRE.—I think I have nothing further to add. The only thing I would like to add to Dr. Heldt's discussion is that if he will add alkali to the regimen, he will get quicker results. There is no doubt that his ideas are right about dehydration but the mere giving of fluids alone will not produce as direct a rise in the alkali reserve as adding alkali will.

DR. DEVLIN.—What form of alkaline treatment do you give?

DR. MCINTYRE.—We are guided entirely by the alkali reserve. I give alkali to the patient until the alkali reserve comes up to normal because if you give too much alkali, you can get the opposite condition or alkalosis, which will cause just as much swelling of the brain as the other conditions of acidosis.

PELLAGROUS INSANITY.*

By T. C. COOPER, M. D.,
Assistant Physician, Central Louisiana State Hospital.

Pellagra was first recognized as a disease entity in Southern Europe, early in the eighteenth century, or approximately two hundred years ago. No definite date can be given for the recognition and description of this malady, but 1735 is the date usually accepted, and Gasper Casal, of Spain, is credited with the first description of the disease.

The name "pellagra," from the words "pella"—skin, and "agra"—rough, is said to have been in use among the people where this condition prevailed, but was not generally accepted until introduced by F. Frapolli, in 1771.

The first time pellagra was suspected in the United States was in 1864, when Dr. Gray, of Utica, New York, and Dr. Tyler, of Massachusetts, reported two probable cases. The next cases mentioned were in 1883, 1889, 1902, and again in 1906. In 1907 the United States Public Health Service started investigations in Alabama, following a report of several cases in that state. Reports of cases in other Southern States began to appear, and as a result Dr. C. H. Lavender was detailed by the Surgeon General to investigate and to prepare a precis on the subject. This was submitted in July, 1908, and was immediately published and widely distributed, and undoubtedly was the means of stimulating the intense interest and thorough investigations with which this disease has been studied since that time. It is interesting to note that pellagra in Louisiana was first reported by Dr. John N. Thomas, of Pineville, in 1909, who gives Dr. Lavender's paper full credit for its recognition at that time.

The etiology of pellagra has not as yet been definitely settled. In 1810 Marzari suggested that it might be due to the eating of corn, which at that time was supposed to be deficient in protein. In 1856 this was carried further by Lussana and Frua, who ex-

* Read at the eighty-third annual meeting of The American Psychiatric Association, Cincinnati, Ohio, May 31, June 1, 2, 3, 1927.

plained that due to the poverty of protein in corn, there was an "insufficient neuromuscular repair." Lombroso next advanced the theory that pellagra is "an intoxication produced by poisons developed in spoiled corn through the action of certain micro-organisms, in themselves harmless to man"; and until within the last few years this theory was almost universally accepted. In 1905 Sambon suggested the theory that pellagra is an insect borne parasitic disease. Others claimed it is due to an intoxication with colloidal silica contained in the drinking water. The analogy between beriberi and pellagra led Funk (in 1912) to believe that pellagra is due to a food deficiency of a substance or substances which he called "vitamins." At the present time the last named theory, that is, that pellagra is a tropho-neurosis, due to a food deficiency or unbalanced diet in which there is a lack of certain so-called vitamins, especially vitamin "B," is quite generally, although not universally, accepted; for many believe that this only partly explains the cause of pellagra, and believe that a food deficiency plus infection by some unidentified organism is probably the real cause of this condition or disease.

It is estimated that ten years ago (1917) there were 125,000 cases of pellagra in the United States; most of these being in the Southeastern States. Since that time the number of these cases has very materially decreased, as has also the interest in this malady, and at the present, except for the magnificent work that has been and is still being done by Dr. Joseph Goldberger and his associates in the United States Public Health Service, comparatively little attention is being focused on this disease.

Estimates based upon cases reported in 1925, and upon deaths recorded for the same year, indicate that at the present time there are not less than 25,000 cases of pellagra in the United States, and there are probably many thousands more.

There is nothing pathognomic of the early symptoms of pellagra. With few exceptions there is a gradual loss of weight and strength, disturbed sleep, headache, dizziness, and various and sundry nervous manifestations. The appetite is often capricious and complaints of indigestion are common. There is sometimes a burning sensation of the mouth and often a redness, especially of the tip and edges of the tongue. There are also various irregularities of the bowel which usually end in a chronic diarrhea. After a variable length of time

a rash appears which is the most characteristic single symptom of the malady. This consists of an erythema, followed by pigmentation, which is usually bilateral and nearly always appears on the back of the hands, and less frequently on the arms and elbows, back of the feet, face, neck and perineal regions. The intensity varies from a slight blush or roughening, to a very marked eruption with blebs, and in some cases a sloughing of the epidermis with the formation of ulcers, which heal slowly if at all. In the early stages the eruption may be mistaken for sunburn or chapping of the hands or feet, or for eczema, and in elderly people for senile atrophy with pigmentation, and rarely for some other condition.

As it is not the intent of this paper to stress the general symptomatology of pellagra, it will suffice to say that the possibility of this disease should not be forgotten in cases of chronic indigestion with spring exacerbations, neurasthenia, melancholia, dysentery, eczema, sunburn or chapping of the hands and arms, face and neck, or feet, persistent dizziness, epileptiform seizures, vaginitis, and obscure abdominal symptoms referable to the appendix, ovaries or gall-bladder.

The relationship which various nervous and mental disturbances bear to pellagra has not as yet been definitely settled. It is a well known fact that fifteen years ago there were many more cases of pellagra in our hospitals for the insane than there are to-day, especially was this true in the Southeastern States, but this also applies to some Northern institutions. Inasmuch as pellagra had not been generally recognized in this country until that time, it is quite probable that many of these cases may have had pellagra before their admission to a hospital for the insane, but it is also certain that a large proportion of these cases developed in the various institutions. Because of the large number of deaths occurring from this disease, the physical symptoms, pathology, and particularly the etiology and treatment, received the attention and efforts of a number of our best physicians and scientists, and while the mental abnormalities were not forgotten, they were perhaps not stressed as much as the other symptoms.

In view of the fact that only 4 to 10 per cent of pellagrins are said to develop a psychosis, and many of the cases admitted to our state institutions have such varied symptoms, such poor histories accompany them, and so often are unobtainable from their friends

or relatives, it is often impossible to determine whether the pellagra is the primary condition and the psychosis secondary, or the psychosis primary and the pellagra secondary. The majority probably belong to the last named group. Adding to the difficulty in determining the primary condition is the fact that many psychotics have very capricious appetites, and the physician and nurses in charge of these people often have great difficulty in getting them to eat at all, and particularly to eat a well balanced ration, and this would seem to be an important etiological factor in the development of pellagra.

Up to the present there is no symptom complex that can be said to be pathognomonic of pellagrous insanity. While there are certain symptoms that are usually present, it is believed that in cases uncomplicated with a primary psychosis, the symptoms present are those caused by a physical and neurological degeneration.

Probably the first and most persistent mental symptom is that of depression. In general this is mild, is combined with a certain amount of apathy, there is a tendency for this to show in the facial expression, and in the general carriage of the patient. These people are sick, and both look and act sick. A pellagrous mania has also been described, but neither of these conditions is characteristic of the manic-depressive psychoses.

In the early stages the depression is little more than an apathy; later there is an amentia, with loss of memory, confusion, hallucinations and paresthesias, from which there arise morbid impulses and delusions; but a pellagrin when depressed never has the lucidity of the non-delusional melancholic, and his errors of judgment do not have the characteristic coherence of melancholic delusions. When this amentia is accompanied by an apparent exaltation which gives it some resemblance to mania, the pellagrin displays more confusion than gaiety, a marked agitation, and has no apparent goal idea. In both conditions they are nearly always dreamy, confused, forgetful and stupid, and can seldom give an account of their past history. If only a superficial mental examination is made it is not uncommon for these cases to be classed in either the manic-depressive or dementia precox group of psychoses.

Following the stage of amentia there develops a true dementia, and at least in some cases, and where all clinical and laboratory tests for syphilis are negative, there is an increased pressure of the spinal fluid and an edema of the brain.

In the acute cases of the so-called "typhoid type," there is usually, if not always, some fever ranging from 99 to 104 degrees, and this is frequently accompanied by a delirium of the low muttering type. This is ascribed to a toxic condition which is often, but not always, secondary to some known infection. In this type of pellagra hallucinations of both sight and hearing are most often found, and as would be expected the prognosis is very bad.

Inasmuch as a vast majority of pellagrins have some anemia, and the nerve cells in common with the entire body organism are poorly nourished, there is a general asthenia, and these people are unable to make any long continued mental or physical efforts.

There is also some degeneration of the spinal nerves, especially those of the posterior and lateral columns, and to a lesser extent the anterior columns. This causes some uncertainty of the gait, a spasticity of the muscles, and various paresthesias, and there is a hyperactivity of the deep reflexes.

These people are quite prone to intercurrent infections of all kinds, particularly tuberculosis, influenza and pneumonia.

Up to the present time there is no treatment that is specific for this disease. Personal hygiene, a well balanced ration, and lots of it, that is rich in vitamins, especially vitamin "B," and plenty of rest and sleep are the essentials. This is often helped by moderate doses of some of the arsenicals, among which soamin, sodium cacodylate, and Fowler's solution are the favorites. In some cases where there is a marked confusion and agitation it has been found that a spinal puncture with the removal of 15 to 30 cubic centimeters of fluid has given some relief for a time, but this should be considered as a measure that is still in the experimental stage. Dr. Hoye, of Mississippi, tells me that recently the British have been using Thyroid Extract in the treatment of pellagra.

As the patients improve they are urged to take moderate exercise, and as they approach the stage of recovery, if they are fortunate enough to recover, diet and hygiene are talked and impressed upon them at every opportunity; as education along these lines and better living conditions is the only known way of preventing this disease.

DISCUSSION.

DR. DUNTON.—Some years ago a physician from the South called attention to a symptom of pellagra which I don't think is generally known and I would like to ask Dr. Cooper if he has observed this. He said that by lightly palpating the forearm there was a distinct change in sensation as though the patient might be wearing a glove. He told me that the same sensation could be found on the lower extremities.

DR. SINGER.—The mental psychoses that occur in pellagra are all of the toxic type. I will mention the case of a patient I have seen within the last few months in which the picture presented, a Korssakow type of psychosis, was one that I have not seen before although I have seen a great deal of pellagra. This attack of pellagra developed in a patient who was suffering from a manic-depressive depression which had been in existence for three or four months before the pellagra appeared. With the appearance of the pellagra there was rapidly increasing stupidity with loss of recent memory and very marked confabulation. As the skin symptoms cleared up, the patient steadily improved. I think it is an error to consider that the outcome of pellagras psychoses is dementia. Even this patient with a marked toxic type of picture has practically completely recovered her memory.

DR. HELDT (Detroit, Michigan).—Inasmuch as we have been inclined to think of pellagra as a disease of the Southern states, I should like to ask Dr. Cooper whether he has any figures as to how frequently it occurs in the North? For the past four years we have had experience with four cases which fit very closely into the symptom picture Dr. Cooper has given to us.

DR. KIRK.—I was glad to hear Dr. Cooper state that pellagra was decreasing in Louisiana. There has been a gradual decrease in the number of cases and in the severity of cases in Arkansas. While the majority of observers feel that Goldberger's theory of the cause of pellagra is correct, yet there are some who still believe that improper diet is not the only cause of pellagra as it does not seem to explain the disease occurring in babies who have been on a milk diet and in a few other cases where it is well known that they have been living on a diet rich in proteins as well as living under good hygienic conditions.

I have not been able to see any benefit derived from drugs. The characteristic symptoms as I have seen them in the majority of cases are: depression, confusion, redness of the tongue and mucous membranes of the mouth, redness of the dorsal surface of the hands and wrists; occasionally of the neck and the dorsal surface of the feet, loss of weight, loss of appetite, diarrhea and complaint of pain in the stomach.

DR. WALKER.—Our admissions due to pellagra reached their height in 1915. Since that time there has been a gradual decline in the number of admissions due to pellagra.

Dr. Goldberger and Dr. Wheeler are still working in our institution and have been for about fourteen years. They have found and we have found in

clinical work that pulverized yeast is a very valuable remedy. Dr. Goldberger and his associates in the hygienic laboratory have produced black tongue in dogs which is analogous to pellagra in man. They have been able to prove that dogs that are given yeast do not develop pellagra although on a pellagra diet.

In the treatment of pellagra we have to remember that many patients who have pellagra in institutions will recover without any medical treatment or without any change of diet. So we have to be more or less cautious in the use of drugs and we are coming to believe that drugs are a very poor remedy. We have found that yeast has been the most valuable remedy we have so far tried.

DR. C. E. GIBBS (Rochester, New York).—I want to ask whether Dr. Cooper has found any abnormality in the cerebrospinal fluid in relation to the acute pellagra—any changes in the spinal fluid in the acute confused period.

DR. THOMAS.—When I became Superintendent of the Central Louisiana State Hospital eighteen years ago or more, I found forty cases of pellagra in a population of 404 patients. I didn't recognize the disease at first but I wrote to the Public Health Service and got from the Surgeon General a brochure on Pellagra and as soon as I got it I at once knew the disease we had was pellagra. Those were the first cases reported in the State of Louisiana. At that time meal made from spoiled corn or kiln-dried meal made from immature corn which had been shipped down from the Western states was supposed to be the cause of this disease.

There had been a big outbreak of pellagra at an institution in Illinois of which Dr. Zeller was Superintendent. There was a pellagra conference held in Columbia, South Carolina, and over 400 physicians attended that conference. I was there myself. After hearing all of the statements and papers read on the subject, I went home pretty well convinced that spoiled corn was the cause of this disease. I at once eliminated grits and corn meal from our dietary and did so for six months or more. The patients, both colored and white, all asked to reinstate corn meal and grits as a food. The governor of the state found out what I was doing and ridiculed the idea of corn meal as being the cause of pellagra. He said he had eaten it all of his life every day and asked me to put it back again in our food dietary. I purchased a grist-mill and from that time on we have been making our grits and corn meal from selected corn. Corn bread is on our tables every day for dinner as well as wheat bread—as much of it as the patients want. The treatment that was given was a well-balanced diet, together with an arsenical preparation known as soamin. The cases we saw in the early stages all got well.

Dr. Goldberger, of the U. S. Public Health Service, visited the institution—examined the cases and our food supply and asked if I wouldn't try treating the cases without giving medication.

I did so by putting them on a well balanced ration and they did equally well although apparent recovery was somewhat delayed. Soamin, an arsenical preparation, is a good alterative and we are still using it.

Pellagra has long since been reduced until we have practically none originating in our wards; only one case originating in the institution in many years. I have come to believe that where pellagra originates in any institution it is because the diet is neither proper nor sufficient.

The physicians of the State of Louisiana know so well how to treat pellagra that while we receive a few from the poor country districts we don't get one case now in comparison to a dozen cases years ago. I say again that where pellagra originates in the wards of institutions there is some fault to find in the feeding and it is a grave reflection on the institution in which it occurs.

DR. COOPER.—Speaking of peculiar sensations of the skin of the forearm, it is quite common to have various paresthesias over the entire body. A burning sensation is the most common, but there may be numbness, tingling or crawling sensations, as well as hypo- or hyperesthesias.

Dr. Singer spoke of dementia being rare when there was a physical recovery. We have found that there is often a mental recovery coincident with a physical improvement, and that a true dementia only occurs late in the disease and where there has been degenerative processes at work.

Regarding pellagra in the North, pellagra exists or has existed in all the states. There is not nearly as much pellagra in the North as in the South, although a few years ago there were quite a number of cases in Illinois, especially in Peoria, and I believe also in Chicago. The latest statistics I have (for 1925) show no reports of pellagra from twenty-four states, one case in North Dakota, two each in Minnesota and Washington, and the largest number (8646) in Mississippi.

Dr. Kirk asked about the increase or decrease of pellagra in the Pineville Institution. We have had an increase within the past year. We serve a district that is practically 70 per cent rural and in parts of which economic conditions have recently been bad; this undoubtedly accounts for our increased number of pellagra cases. The Jackson Institution in Louisiana has a population of about 2400 and only had five new cases last year as compared with our twenty-two, but it serves a territory that is much better from an economic standpoint.

The diet that has been recommended by Dr. Goldberger includes not only meat but he also speaks of yeast, and in a Public Health Bulletin that was published in January, 1927, yeast is mentioned. In this bulletin he speaks about Vitamin B which is so abundant in meat and yeast and states that it has recently been found to possess both anti-neuritic and growth-producing properties.

As to the relative prevalence in the sexes: of the twenty-two cases we received last year there were six men and sixteen women. This ratio agrees very closely with the figures that have been given by most observers.

Regarding recovery, fully 75 per cent of the cases we get recover and are able to return home.

As to the cerebro-spinal fluid findings, the pressure is often increased, but there is very little change in the fluid itself except that occasionally the cell count is slightly higher than normal.

I believe that is all.

A STUDY OF 50 CASES OF PSYCHOPATHIC PERSONALITY.*

By G. E. PARTRIDGE, Ph. D.

This report, based upon a study of hospital records, is a summary of available data on 50 discharged cases of psychopathic personality. It is one of a series of orienting studies of this important group of mentally deviated people, now but little understood, for whom therapy is in a remarkably backward state, and in regard to whom the prevailing attitude is one of helplessness if not hopelessness.†

In these 50 cases, diagnosis of psychopathic personality either was made unanimously by the hospital staff or was the prevailing diagnosis offered, except that alcoholics were included if the picture was clearly that of psychopathic personality. The intention was to include only those cases in which there was not a psychotic reaction, or in which the psychotic reaction if present seemed to be secondary to the general psychopathy, and to leave for later consideration cases that had been diagnosed as psychopathic personality with psychosis. The data were accumulated in the ordinary course of clinical consideration of the cases by various members of a staff, presumably with no especial thought of a general investigation.

Twenty-one of the patients were males and 29 were females. Among them are to be found three main types, when they are

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† The orienting studies now in progress or completed include observations upon selected cases at the Maryland Training School for Boys, studies of cases of drug addiction in the Philadelphia General Hospital, survey of the schools of Baltimore, report upon cases observed in the Classification Clinic of Sing Sing Prison, study of cases in this hospital. These studies are preliminary to a projected investigation of psychopathic personality which provides for an intensive study of carefully selected cases of various ages, over a long period of time, and under conditions favorable to the genetic study of the individual in his total social setting. Nothing less, it is felt, would do justice to the importance of this group as a social and psychopathological problem.

distributed with reference to the features seen at a descriptive level. These may be called: (1) Delinquent type; (2) the inadequate type, including here among others those who show the invalid type of reaction; (3) the general incompatible type. The first is shown most typically among the males and the second among the females. The general tendency among the females was towards a mixed reaction, while among the males there were more cases that seemed to be atypical or indistinct.

The Problems

The range of problems occurring in this group of 50 psychopathic personalities may best be understood by considering briefly the individual cases:

Case I.—Boy 15. Early behavior difficulties; untruthful, has terrible temper.

Case II.—Woman 47. Widow. Led an easy life, extravagant. Alcoholism.

Case III.—Man 23. A long history of bad behavior; unreliable, little "sense of right and wrong," finally charged with participation in a robbery.

Case IV.—Woman 36. Married. Invalid reaction, has been indulged. Dominating and hard to get along with.

Case V.—Man 37. Married. Dishonesty, forging, swindling, posing as "big man," alcoholism, probably perverse sexual activities. Behavior difficulties began at an early age.

Case VI.—Woman 24. Married. Was a nervous excitable child. Some bad company. Inadequacy. An affair after marriage. Depression and suicidal attempt.

Case VII.—Woman 37. Married. Alcoholism of 12 years' duration. Had always been uncontrollable, violent temper, could not fit in.

Case VIII.—Man 22. Single. Shy, retiring, queer, sexual fantasies, pliable. Many jobs.

Case IX.—Man 28. Single. Exaggerated, was disagreeable, had nervous spells, drank.

Case X.—Woman 52. Single. Development of invalidism. Progressively more quarrelsome and obstinate.

Case XI.—Boy 18. Began to lie and steal at eight. Much forging of checks. Arrested on charge of stealing a car and "jumping" a hotel bill.

Case XII.—Boy 20. Much running away since 15, cashing checks, forging, stealing.

CASE XIII.—Boy 12. Truancy, stealing, and sexual misbehavior. About 50 runaway episodes.

CASE XIV.—Woman 46. Married. Long history of inadequacy, nervousness and excitability. One suicidal attempt.

CASE XV.—Man 42. Widower. Steady drinking for 20 years. Vagrancy and frequent arrests. No real occupation. Delinquencies appeared early: disobedient, had no honor, could not be trusted.

CASE XVI.—Woman 42. Single. Inadequacy and invalid reaction.

CASE XVII.—Man 41. Married. History of extraordinary violence of temper and actions. Always wanted his own way.

CASE XVIII.—Man 39. Single. Had been drinking since he was 19. Showed lack of interest in school, roving disposition, always easily influenced, changeable, lacked will power.

CASE XIX.—Woman 29. Married. Mysterious history, sexual misbehavior suspected. Came to the hospital because she had become nervous.

CASE XX.—Man 48. Married. Morphinism and chronic invalid reaction. He was a "spoiled child."

CASE XXI.—Man 22. Single. Many somatic complaints. Out late at night, gambling. Had been losing interests.

CASE XXII.—Woman 39. Married. For past 19 years had been subject to terrific bursts of temper. Extragavant, has "mania" for cleanliness and buying. Suspicious.

CASE XXIII.—Woman 52. Married. Irritable, quick-tempered, looking for trouble all the time, wants to appear a martyr. Gradual development of the trouble over a number of years.

CASE XXIV.—Woman 50. Married. Addiction to alcohol (periodic). Was a spoiled child, indifferent and self-indulgent. Did not take life seriously. Sexual irregularity after marriage.

CASE XXV.—Woman 50. Widow. Came to the hospital during an attack following the death of her husband. She had been inadequate, shy with strangers, tended to be solitary.

CASE XXVI.—Man 37. Married. At times excessive use of alcohol. He had always been impulsive. Homosexual relations suspected. Reacted by drinking, after marriage to a woman who neglected him.

CASE XXVII.—Man 34. Single. There is a history of feelings of inferiority. There were many somatic complaints.

CASE XXVIII.—Woman 44. Married. In childhood she was indifferent and indolent. Did not accept responsibility. Resorted to drugs.

CASE XXIX.—Woman 44. Married. Drug addiction, and had used alcohol since the age of 20.

CASE XXX.—Woman 32. Married. Drug addiction and alcoholism.

CASE XXXI.—Woman 25. Married. She was petted and spoiled in childhood, was sensitive, made poor adjustment in married life. Showed somatic fixations, was upset and hopeless.

CASE XXXII.—Woman 27. Widow. Was dependent and irresponsible. She quarrelled with members of her family. After marriage she became interested in men. She became nervous and excited following an operation.

CASE XXXIII.—Man 28. Single. For a long time had had tendency to be depressed and suspicious, worried. It was reported but not proved that he had been addicted to drugs.

CASE XXXIV.—Woman 44. Married. She was suspicious, jealous, impulsive, quarrelled, once attempted suicide.

CASE XXXV.—Man 46. Married. Excessive use of alcohol, intemperate since the age of 15. Some truancy in boyhood, and in adult life no interests except drinking and its accompaniments.

CASE XXXVI.—Man 52. Married. He had been stubborn and headstrong and for some years tended to be worried, depressed and suspicious.

CASE XXXVII.—Woman 28. Married. She was an obstinate child, was spoiled. She became untruthful. Became nervous, lost interest, was untrustworthy, seemed changed after the birth of a child.

CASE XXXVIII.—Woman 40. Single. Nervousness and instability in childhood. No gratitude or appreciation towards family. Intensely egotistical. She wished to dominate those about her, had always been erratic. She has had several attacks of a nervous nature.

CASE XXXIX.—Woman 34. Married. She was sensitive, jealous, extravagant, wept easily, was accused of being cruel to a stepchild. Showed invalid reaction, wished admiration from everyone.

CASE XL.—Boy 19. For the past three years there had been gradual deterioration in his behavior. He thought people made fun of him. Turned hobo, associated with people of lower class. When on a trip got into a fight, and was apparently confused.

CASE XLI.—Man 59. Married. He had been more or less addicted to alcohol all his life. He always tended to worry over trifles, and was periodically on the outs with some member of his family. He tried to dominate.

CASE XLII.—Woman 22. Married. She was irritable and hard to get along with. Reported to have had affairs with several men. Spent money carelessly. Mistreated her child. Lied. Attacked her husband.

CASE XLIII.—Woman 28. Married. She was a sickly child, requiring much attention. Later was nervous, irritable, demanding. Became nervous after a miscarriage.

CASE XLIV.—Woman 37. Married. In youth was of the tom-boy type. Personality changes during married life. Love affair, day-dreaming. Lost interest in the home, was depressed. Weakness and insomnia.

CASE XLV.—Man 43. Married. Nervous breakdown following being discovered addicted to perserve sexual practices with boys.

CASE XLVI.—Woman 23. Single. She was always quick-tempered, wished everything her own way, was critical, jealous, always scrappy and difficult with the children in school. Always undecided. A tantrum over her sister's approaching marriage.

CASE XLVII.—Woman 41. Single. Difficult from childhood. Energetic but obstinate, domineering, worried, at times was resentful and jealous. Lazy, remembered unpleasantness. Considered her own pleasure. Tantrum and excitement preceded coming to the hospital.

CASE XLVIII.—Woman 20. Married. She was a spoiled child, had no sense of responsibility. Very early marriage. Nagged her husband. Many obscure complaints, had nervous spells. Invalid reaction after operations.

CASE XLIX.—Woman 32. Single. Was a "spoiled child." Had frequent temper tantrums. Always had what she wanted. Always had a gay life. Excitement and over-activity preceded coming to the hospital.

CASE L.—Girl 16. Difficult to handle, antagonistic to her mother, became almost incorrigible. Stubborn, easily offended. Unstable in her emotions.

TYPICAL CASES

Among the males 10 may be called chronic delinquent, three are inadequate, and the remainder are either chronically incompatible or somewhat mixed or indefinite in type.

Among the females, seven are of the behavior or delinquent type, eight are inadequate, including those who show reactions of invalidism, and 14 may be grouped for present purposes as generally incompatible since they show emotional instability and inability to adjust.

Below there is presented a typical case of each group mentioned, illustrating the differences in the types and in the characteristics of males and females.

Case XI, delinquent type, is typical of this group:

Male, age 18.

Problem.—Chronic delinquency. He began to lie and steal when he was eight and has continued in this course. For the past few years he has been forging checks, spending money in cafeterias, and treating, his purpose appearing to be to attract friends. Early in the year of admission he forged

about eight checks, one for $250.00. He had pistols and a rifle. He was arrested finally on a charge of stealing a car and "jumping" a hotel bill.

Family History.—The family in direct line appears to be free from psychopathic tendencies, but in branches of the family there are psychopathic personalities. The mother is very jealous.

Personal History.—He is said to have been a quiet child who grew slowly to the age of seven. There is a history of bed-wetting to four, spinal meningitis at 14. His brother, younger, has always outclassed him in sports and probably in popularity. During the past four years there has been truancy. The patient stated that some people have said that he stuttered. His first heterosexual experience was at 16, with a prostitute, and he has been a few times with prostitutes since.

Physical Examination.—He is a fairly well-developed and well-nourished boy. With the exception of gonorrhea nothing was found amiss in the physical condition.

Course in the Hospital.—In the hospital he cooperated well, but at times he was very boastful. He showed no emotional reactions in the examination except when he spoke of his father's attitude towards him. He insisted that his intentions were good and that he could not help his stealing and forging. He showed lack of foresight, and on discharge seemed to take the whole matter of his difficulties lightly.

The data in this case do not show us very much, but we observe the persistence of the type of behavior that appeared early in life, the neurotic signs such as bed-wetting, suggestions of feelings of inferiority and tendency to buy friendship, boasting, the emotional reaction to the father, and the inability or unwillingness to make definite efforts to solve his problems of behavior by planning for the future.

The inadequate reaction is well represented by Case VIII:

Male, 22.

Problem.—He is shy and retiring, queer and erratic. He has had very many jobs, and is discharged for lack of interest. There have been no delinquencies, but he is pliable and it is feared that he may be led into criminal activity. There is rich sexual fantasy, and masturbation which began at 18.

Family History.—No psychopathic heredity of any kind was discovered. The father is over-bearing and seemed to have contempt for the patient. The mother was kindly and protecting. She died four years ago.

Personal History.—He has been mild and easy-going, seemed to have no temper, and to lack emotion. Interests are narrow. He went to a military school, but did not fit in there, the boys regarding him as a "joke." There is no definite history of homosexuality, but the patient spoke vaguely of some incidents of early youth, said that his social relations were never the same as others, and that his feelings were those of a girl. Six months before admission to the hospital he had sexual relations with a prostitute.

Physical Examination.—The examinations were essentially negative.

Course in the Hospital.—He mixed well, on the whole, but showed self-consciousness and constraint. He seemed well-satisfied with himself. He had been thinking about music and art work, and was writing a play which was infantile in conception. There was evidence of a strong attachment to his mother.

Here we see a profoundly affected personality, with inferiority feelings reflected in the shyness and aloofness; and evidence of imperfect compensation appears in erotic dreamery and preoccupation with artistic ambitions in fields in which he has no talents. The result most apparent objectively is ill-adjustment to vocational life, and inability to take a practical attitude towards his difficulties and the future.

Chronic emotional ill-adjustment is well illustrated by Case XXXVI:

Male, 52, married.

Problem.—He is a man of college education who had been a preacher. He early showed personality difficulties, and about five years before admission to the hospital was depressed and suspicious, later was argumentative, threatened members of his family and neighbors.

Family History.—The family shows some psychopathy. The father was alcoholic. One brother drank for many years, another has been a globe trotter most of his life, one became a vagabond early in life.

Personal History.—He married while in college, preached for a time, but had many difficulties, could not get along comfortably with people, was stubborn and headstrong. He then went into various ventures, usually giving them up when they were successful. He was in the real estate business, and more recently in the grocery business. In the real estate business he was expansive in his tendencies, and he used money independently. In the grocery business he had difficulties with people, argued with customers over trivial matters. He has shown a tendency to be familiar with girls, and there was one case in which he was supposed to have been responsible for the pregnancy of a girl. He continued to preach about morals and evils. He blamed difficulties upon others, was selfish, dominating, extravagant, suspicious, accusing, quarrelled with his wife frequently.

Physical Examination.—He is well developed and well nourished. There is moderate exophthalmos. The front teeth are irregular and widely spaced. There is chronic flushing of face and hands and sparse body hair.

Course in the Hospital.—He cooperated well, but showed some suspiciousness and tendency to depression and worry. His attitude was that of one injured by false charges. He said that things excited him, that he had been under nervous tension, that his wife was hard to get along with. He admitted having some suspiciousness. He became interested in a young

man patient in the hospital, improved greatly under treatment, but later showed sensitiveness, was concerned about his wife's earning, wanted to be again at the head of his family, suggested undesirable ideas to other patients. He left the hospital, and it was learned later that he was acting as a travelling salesman.

Data on this case, also, show us little of the underlying causes. There is the history that he was only four or five when his mother died, and that he was brought up by three great aunts, all unmarried, that he was frequently whipped and was kept strict, and that he left this home when he was 18. There is much in the history to show that he lacked security in his social position, and was for many years defensive against others. His tendency to interrupt any course he was pursuing, even when successful, is striking, as is also his tendency to thwart himself by antagonizing people.

Among the women the chronic delinquency case such as that represented by Case XI does not appear. Case XXIV will show the approximations to this type appearing among the female cases:

Woman, 50, married.

Problem.—There is a history of periodic drinking since the age of 22. She was a spoiled child, but there was no truancy or other delinquency, although she was indifferent and self-indulgent, and would not take life seriously. There was sexual irregularity after her marriage, and much drinking in sprees. She lost self-respect, was in many sanitariums.

Family History.—There is a history of drinking in the family. The father and all the paternal uncles drank, and the father is described also as a hard-driving man, and severe. The mother was easy-going, and had no great desire to accept responsibility; and the one maternal uncle was fascinating but idle and a drinker. The patient was the eldest of four, and was the only deviated one.

Personal History.—She is said to have been a happy child, easy-going, spoiled, but not allowed beaux until eighteen. She married at 22 a man much older, a sporting man who was a drunkard. A child was born within a year, but she drifted away from her husband, lived with another man on occasions. When she was 27 her husband died. She was devoted to her child but her parents relieved her of all responsibility. Her life continued to be one of dissipation. There is a history of drug taking and of one theatrical attempt at suicide; and it was said that she married to get freedom, and that her husband's sexual advances repelled her.

Physical Examination.—Examination was essentially negative. She looked healthy.

Course in the Hospital.—She adapted herself well to life in the hospital, and talked about her history. She stated that she was never encouraged to accept

responsibility, and that she had always had a tendency to blame her mother. She had no foresight and no great amount of self-respect. She was nervous after her child was born, wanted to be doing something, to go and have a good time. She became dominated by the man with whom she lived, had scruples in regard to the relationship but could not control herself. She drank at first because everybody drank and because she was unhappy and drink gave her a sense of divine freedom. Afterwards there was remorse.

The history shows, on the surface, a happy-go-lucky girl who was a "typical society girl" at 18, and was not brought up to take responsibility; and who drifted after marriage into loose ways. Closer study reveals unhappiness, some demand for freedom from circumstances that appeared to be satisfying, some antagonism towards the mother, conflict over conduct.

Another group of cases is that in which inadequacy with a tendency towards the invalid reaction is the predominant characteristic. These cases vary much from one to another, and may shade over into the delinquent and the emotionally unstable, but the picture is fairly consistent, and is represented by Case XLVIII:

Woman, 20, married.

Problem.—She was spoiled, was married at 16 secretly, had had no sense of responsibility. She showed much fear of the sexual relation, and after the birth of her child nagged her husband, and has been constantly complaining. She had many obscure complaints, such as numbness in the legs. After a double ovarian cystectomy she was worse, with invalidism and emotional reactions. She would have spells in which she would close her eyes and clutch her throat, had bad dreams, would complain of being blind and could see only light, something in the throat arose and choked her.

Family History.—The father drank, was fiery-tempered. The mother was easy-going and gave the children their own way. A paternal uncle shot himself. The brother became epileptic at eighteen, is a gambler and drinker.

Personal History.—There is little to add to the statement as above. She is said to have been active when a child, went to parties, had boy friends, and was interested in athletics. She became a telephone operator when she was 15.

Physical Examination.—The physical examination was negative.

Course in the Hospital.—In the hospital she showed self-pity, was egoistic, plaintive, was particular about her appearance, complained of inability to do things, was resistant to mental tests (said that she was being treated like a child), showed lack of real affection for her husband, said that she was too young to get married, tried to give the impression that she had been imposed upon and that everything had been hard for her, did not admit her faults. She spoke as though she had sacrificed herself. She had a way of seeming to defend herself from criticism before any criticism was made. She seemed selfish, talked about herself, was childish in judgment, somewhat demanding, rather susceptible to the pleasures of the moment, showed little foresight.

The most conspicuous feature of this case is the infantile quality of her attachments and reactions. She never had accepted the responsibility connected with marriage, and showed that she wished to return to the state in which life has less responsibilities and more of the pleasure of youth.

The general incompatibility type is well represented by Case L which is a somewhat extreme instance of the frequently recurring "impossible" child, the child in whom social ill-adjustment is the outstanding feature:

Girl, 16.

Problem.—She was difficult to manage, incorrigible, antagonistic to her mother. She was critical and could not keep friends, was constantly in trouble with other children. She was aggressive, stubborn, easily offended, extremely egotistical, easily irritated, sometimes gloomy and pessimistic, at times seclusive and jealous. She never got on well with her brother and sister. She must always direct in games or she would not play. She became so difficult to manage, and especially was so unruly in school that she was sent to the hospital.

Family History.—The paternal grandfather is said to be selfish and self-centered and addicted to alcohol. The maternal grandfather has had a nervous breakdown. The father is high-strung as is also the mother. One paternal uncle is schizophrenic.

Personal History.—Her birth was entirely normal. She was nursed two months, then had an "indigestion." In childhood she was round and chubby. When ten she is said to have been inclined to talk of wanting to be a boy, and she has continued to take an interest in athletics. All adjustments have been made for her, and she has never shown, it is said, real judgment. Antagonism towards the mother is pronounced. Her school life has been stormy, and there was a time when she worried over school. Intelligence is high.

Physical Examination.—She is well developed but thin, well muscled, active.

Course in the Hospital.—Her conduct in the hospital continued to express well her characteristics as already told. She was pert, over-active, impulsive, interfering, but at the same time sensitive to criticism. She resented discipline, complained that people hurt her feelings and crushed her. She was rude to nurses and physicians, seemed to like to annoy other patients, had no tact whatever, was talkative, restless, sometimes silly and unladylike, said that she tried not to be bad, but that there were things that she felt she must do. She had no stability in her work, seldom was interested enough to finish anything. She was sometimes affectionate towards nurses and other patients, and displayed conduct which indicates homosexual impulses.

Although this case is unusual in its severity, and there is a possibility of an organic background for the behavior deviation, it represents well a type of case often found in women in which there are persistent ill-adjustment and unstable emotional reactions. The picture is that of a highly independent self-confident girl who is extremely non-conformist in her attitudes. A little analysis shows marked feelings of doubt and inferiority, unhappiness and inability to control reactions in accordance with ideals.

General Features

The general outline of these cases can best be presented in terms of the descriptive words employed by informants:

Case I.—Unruly, had temper, determined, no consideration, teased, nervous, nagged, impulsive, erratic, lacked reasoning, had poor judgment, mischievous, blames others, showed sex embarrassment, rationalizes, egotistic, lacks insight, criticizes, has no sense of responsibility, has vague restless urge, demanding, interfering, violent.

Case II.—Extravagant, violent, tantrums, wilful, emotional instability, demanded attention, selfish, critical, seemed not truthful, complained of mistreatment and bad luck, seemed underhanded, disagreeable.

Case III.—Unreliable, had little sense of right and wrong, sought bad element, lacked frankness, craved "bright lights," had strong play motive.

Case IV.—Contrary, independent, restless, free and easy, impulsive, irregularly energetic, has quick temper, censured friends, dominating, fond of dress, susceptible to flattery, irritable, jealous, quarrelsome, showed invalid reaction, had temper tantrums, abusive, crafty, undependable.

Case V.—Dishonest, posed as big man, boasted, exaggerated, surly, reserved, abrupt, mixed with bad people, sexually irregular, seemed shallow, indifferent.

Case VI.—Didn't accept responsibility, had temper tantrums, got into some bad company, never energetic, had no special enthusiasms, irritable, had crushes, marked feelings of inferiority, chicken-hearted, affectionate, sympathetic, credulous, bashful, showed sex shyness, discontented, restless.

Case VII.—Violent temper, no interests, wishes adoration, asks special consideration, dreamy, indifferent, uncontrollable, blames others, defensive, has self-pity, irritable, sensitive, takes superior attitude, unreasonable in demands, expects sympathy, expects special favors and to have excuses made, thinks he is treated unfairly, emphasizes past unhappiness, hates authority, dislikes any hampering, critical, jealous, procrastinating.

CASE VIII.—Lacked interest, easily led, mild and easy, timid, has no temper, seems to lack emotion, has narrow interests, seems satisfied with himself, rich sexual fantasy.

CASE IX.——Nervous spells, exaggerated, disagreeable, impetuous, critical, obstinate, has no close friends, dissatisfied.

CASE X.—Aloof, resentful, quarrelsome, obstinate, undecided, unhappy disposition, wanted own way, worrisome, avoided duty, some nervousness, always asked advice, energetic, had violent temper, no real interest, likes activity and change, restless, irritable, dissatisfied, superficial in talk, sensitive, petulant, wished to be considered first, made no effort at self-control, restless, apprehensive, inadequate.

CASE XI.—Lied and stole, was truant, "bought" friends, showed lack of foresight, lacked seriousness.

CASE XII.—Had runaway tendencies, had night terrors.

CASE XIII.—Stole, was truant, had runaway tendencies, boastful, craved attention and affection.

CASE XIV.—Inadequate, nervous, excitable, undecided.

CASE XV.—Disobedient, had no honor, vagrant, troublesome, had temper tantrums, was dishonest, made promises, reckless, liked forbidden activities.

CASE XVI.—Inadequate, made invalid reactions.

CASE XVII.—Had violent temper, insistent upon own way, wilful.

CASE XVIII.—Roving, restless, easily influenced, changeable, lacked will power.

CASE XIX.—Indiscreet, grandiose, dressed flashily, laughed much, wishes to be leader, obtrusive in manner, tends to assert rights.

CASE XX.—Made invalid reaction, suspicious, jealous, unmanageable.

CASE XXI.—Anxious, wandering, restless, troubled about health.

CASE XXII.—Violent temper, self-accusing, blames others, grandiose, untruthful, wants attention, extravagant, quarrelsome, suspicious.

CASE XXIII.—Easily perturbed, suspicious, irritable, appears injured, quick-tempered, wanted sympathy, craved affection, sensitive, told disagreeable things, wished everything own way, quarrelled, sulked, moody, uneven, blamed others, egotistical, worried, seemed insincere, boasted, interested in dress.

CASE XXIV.—Indifferent, self-indulgent, wouldn't take life seriously, easy-going, did not apply herself, nervous.

CASE XXV.—Solitary, nervous, invalid reaction, tired easily, quiet, liked attention, suspicious, critical, seemed insincere, blamed others, had many hypochondriacal complaints.

CASE XXVI.—Impulsive, over-modest, dissatisfied, changeable, resentful, complained, insistent, irritable, made many requests.

CASE XXVII.—Anxious, had sense of inferiority, suspicious, changeable, dissatisfied, nervous, scrupulous, had fears, tried to attract attention, had effeminate ways, quiet, lacked initiative, a follower.

CASE XXVIII.—Indifferent, indolent, lacked resourcefulness, jealous, seclusive, complained, moody, inadequate, erratic, petulant, lacked interest, frivolous, no sense of responsibility, unstable, self-willed, took opposite views, had temper, had many prejudices, selfish, sensitive, nervous, had anxiety and depression, sought attention, had restless feelings, showed superiority reaction, exaggerated discomforts, showed childishness, had fears.

CASE XXIX.—Cheerful, had few worries, became indifferent, never irritable, social, liked good time, artistic, well-balanced, excitable, defensive, sought situations in which she was superior, superficial, tended to be complacent.

CASE XXX.—Little interest, languid, had somatic discomforts, restless, could not banish unpleasant thoughts.

CASE XXXI.—Sensitive, talkative, jolly, energetic, tom-boy, blushes easily, prudish, fearless, happy (in childhood).

CASE XXXII.—Dependent, irresponsible, petted, quarrelsome, childish, tried to attract attention, self-satisfied, petulant, egotistic, lacked emotional depth.

CASE XXXIII.—Does not meet people easily, paranoid reaction.

CASE XXXIV.—Jealous, impulsive, seclusive, scolding, accusing, reserved, has temper, a little backward socially.

CASE XXXV.—Active in sports, a good mixer, sexually passionate.

CASE XXXVI.—Stubborn, headstrong, argumentative, blames others, selfish, dominating, not a good mixer, bad temper, suspicious, took injured attitude, paranoid.

CASE XXXVII.—Affectionate, spoiled, extravagant, dependable, obstinate, untruthful, artistic, talkative, complained of lack of attention and of the way treated.

CASE XXXVIII.—Nervous, unstable, egotistical, erratic, wishes to dominate, has poetic and literary tastes.

CASE XXXIX.—Irritable, jealous, extravagant, easily offended, thinks only of herself, made invalid reaction, wanted admiration, sulked, affected, interested in her body, nervous, seems to expect censure, interest in clothing.

CASE XL.—Irritable, seclusive, depressed, thought people made fun, wandered, gloomy, morose, little initiative, had poor judgment, found fault, stubborn, sociable, proud, vain, lacked self-reliance, over-critical, extremely conceited, shy with girls.

CASE XLI.—Worried over trifles, did not take responsibility, socially backward, did not assert himself.

CASE XLII.—High tempered, wanted own way, interested in personal appearance, talked of having had unhappy life.

CASE XLIII.—Required much attention, nervous, irritable, contrary, demanding, good mixer, complained of bad treatment, disagreeable and sarcastic.

CASE XLIV.—Liked good time, jolly disposition, luxurious habits, had little responsibility.

CASE XLV.—A leader, social, always religious, not athletic, spent money freely, showed bitterness, martyr-like reaction, emotional.

CASE XLVI.—Quick tempered, at times uncontrolled, made many demands, jealous, wished everything her own way, always scrappy and difficult in school, undecided, couldn't be driven, energetic, not affectionate, had no definite plans, dominating, did not consider rights of others, stormy, argued, impulsive, selfish, had ideas she was better than others, blamed others, restless, felt unfairly treated, disliked routine, childish in attitudes, resented interference with her liberty.

CASE XLVII.—Difficult person from childhood, energetic, obstinate, aggressive, over-talkative, domineering, worried, resentful, jealous, remembered unpleasantness, showed temper, a leader, guided by likes and dislikes, no thought of future welfare.

CASE XLVIII.—No sense of responsibility, nervous, nagged, had obscure complaints, particular about appearance, did not admit faults, showed self-pity, egotistic, plaintive, complained of inability to do things, petulant, selfish, restless.

CASE XLIX.—Had temper, grudges against family, showed hatred, always had what she wanted, no wide interests, fond of gay life, cunning and sly, sometimes showed poor judgment, apt to be reckless, talkative, a hustler, irregularly energetic, restless, had much tension, high strung, haughty, impulsive.

CASE L.—Difficult to handle, showed antagonism, nearly incorrigible, could not keep friends, critical, in constant trouble, had no pride, aggressive, stubborn, easily offended, egotistic, unstable in emotions, easily irritated, sometimes gloomy and pessimistic, wished to be the boss, at times seclusive and jealous, stormy, never showed real judgment, little affectionate, sensitive, impulsive, resented discipline, rude, had no tact, seldom interested in finishing things, talkative, silly and unladylike at times, restless, did little work.

PHYSICAL FINDINGS.

Case	I	m	15	Extreme height, palate high and narrow, infantile hair distribution.
"	II	f	47	Heavy growth of hair, excessive weight, had thyroid enlargement.
"	III	m	23	Stout in build, eyes slightly prominent.
"	IV	f	36	Tendency towards masculine build, heart small, anemic.
"	V	m	37	Slight obesity, palate high, some exophthalmos.
"	VI	f	24	Has always been stout, thyroid enlargement, slight tremor.
"	VII	f	37	No pathology.
"	VIII	m	22	Essentially negative.
"	IX	m	28	Essentially negative.
"	X	f	52	Undernourished.
"	XI	m	18	Negative.
"	XII	m	20	Negative.
"	XIII	m	12	Right foot deformed, lateral nystagmus.
"	XIV	f	46	Large, teeth imperfectly developed, infantile appearance, positive dermatographia.
"	XV	m	42	Essentially negative.
"	XVI	f	42	Palate somewhat narrow.
"	XVII	m	41	Florid, marked disorder of accommodation.
"	XVIII	m	39	Florid, features pointed, palate high and narrow.
"	XIX	f	29	Some fullness in thyroid.
"	XX	m	48	"Physical wreck" on admission, many areas sensitive to deep pressure.
"	XXI	m	22	Poorly developed, blood pressure low, spastic colon, stomach of fish-hook type.
"	XXII	f	39	Short and stout, small hands and feet, subcutaneous fat abundant, heavy growth of hair.
"	XXIII	f	52	Anemic.
"	XXIV	f	50	Essentially negative.
"	XXV	f	50	Right hand weak.
"	XXVI	m	37	Posterior muscles of right leg and thigh atrophied.
"	XXVII	m	34	Blood pressure 150, intestinal stasis, some flushing, some increased reflexes.
"	XXVIII	f	44	Obese.
"	XXIX	f	44	Exophthalmos, thyroid adenomata, evidence of hyperactivity of the thyroid.
"	XXX	f	32	Spare.
"	XXXI	f	25	Essentially negative.
"	XXXII	f	27	Fine tremor of the hands and tongue.
"	XXXIII	m	28	Slender, only moderately well developed, systolic murmur.

Case	XXXIV	f	44	Negative.
"	XXXV	m	46	Knee jerks plus, liver slightly enlarged.
"	XXXVI	m	52	Moderate exophthalmos, front teeth irregular, sparse body hair, chronic flushing of face and hands.
"	XXXVII	f	28	Negative.
"	XXXVIII	f	40	Suggestion of prognathism.
"	XXXIX	f	34	Hypersensitive to touch over entire body.
"	XL	m	19	Chest flat, hands and feet moist, rapid pulse.
"	XLI	m	59	Negative.
"	XLII	f	22	Had goitre removed year before.
"	XLIII	f	28	Some thyroid enlargement.
"	XLIV	f	37	Negative.
"	XLV	m	43	Negative.
"	XLVI	f	23	Negative.
"	XLVII	f	41	Small, obese, small hands and feet, eyes and orbits deeply set.
"	XLVIII	f	20	Negative.
"	XLIX	f	32	Thin, thorax flat, uterus small, apical systolic murmur.
"	L	f	17	Negative.

The most noteworthy fact regarding the physical findings is that in 13 cases there is evidence of some anomaly of function of the endocrine glands. These are Cases I, II, III, IV, V, VI, XIV, XIX, XXII, XXIX, XXXVI, XLII, XLVII. Among these 13, six gave some history of thyroid enlargement. Histories are not refined enough to show much more than the presence of the condition; whether the endocrine disorder followed or preceded the mental manifestations, whether it had any causal relation with the behavior in either direction is not revealed.

History of the Family.

The histories are neither complete nor conclusive in regard to many points about the family that would be of interest. In 24 cases there is evidence of psychopathic persons in the direct ancestral line. In seven more there are other forms of neuropathy or psychopathy than those the subject of our investigation. Six more families are suspicious on evidence such as the following: Psychopathic personalities in collateral branches; the father disappeared; maternal uncle disappeared; alcoholism in various members of the family; many maternal relatives psychopathic; some of the siblings

show personality deviations. In 13 cases, the family is negative for psychopathic traits so far as the evidence goes. There is evidence of some pathological trait on both the paternal and the maternal side in six cases among the total of the first two groups mentioned.

Although no conclusion can be drawn from these facts regarding the inheritance of psychopathic personality, it is to be noticed that there is some psychopathic or neuropathic background in 31 instances.

Occupation.

Of the 21 males, three were school boys, three were salesmen, two were brokers, one was an insurance agent, one was in the real estate business, two were clerks, one was a physician, two were in the grocery business (one had had previously other occupations, was a preacher and then in the real estate business). There was one schoolmaster, one general foreman in a telephone company, one young man had deserted from both the Army and the Navy, one seldom worked, two had had many jobs.

Of the females 12, married, seem to have had no other occupation at any time than that of housekeeping. Ten of the married women had at some time worked at other occupations than housekeeping as follows: In factory and as dressmaker; "mother's helper"; saleswomen; telephone operator; in telegraph office; teacher and milliner; teacher; office positions; in factory; teacher; telephone operator. Of the seven single women, one was on the family farm; one had no occupation; one was a nurse; one a teacher; one a teacher and then social worker; one was a school girl; one worked in a factory and was later a dressmaker.

As regards vocation, there is nothing very outstanding, but among the males there is a noticeable lack of occupations that require definite and long continued training, and a strong tendency to change of occupation. With the women the vocational history merges into the general history.

Attitude in the Family.

In 21 of this series there is mention of attachment to or antagonism towards one or the other parent. Attachment to the parent

of opposite sex is most frequently mentioned, 12 times. There are six cases of antagonism towards the parent of the same sex, and only one of attachment to the parent of the same sex. Antagonism towards the parent of the opposite sex was mentioned twice. Among the 21 there was recorded also once criticism of the mother on the part of a female patient, and in another case it was said that the mother irritated the daughter. There were in the whole series four instances of attachment to a sister, three of these on the part of women patients, and one case of attachment to a brother on the part of a woman. One woman was said to have shown marked antagonism towards her sister.

Adjustment in the Sexual Life.

Of the 29 women, 22 had made heterosexual adjustment to the extent of having been married. In two cases there is no evidence as regards the adjustment to marriage. In one there is only the item that there was much dependence upon the husband. Two marital situations are described as having been for a time happy. Otherwise there is no case in which the marital relations appear to have continued to be satisfactory. Six of these women were said to have had affairs with one or more men after their marriage; in four cases there was reported dislike for the marital relation or reserve regarding it. Four were said to be jealous or the like, one quarrelled with her husband. One was divorced on account of her drinking. Two did not wish to have children, two had miscarriages or abortions that may have been self-induced. One had had a somewhat mysterious career, and was probably promiscuous in her sexual relations. There was one widow with an interest in married men.

Data in the cases of the single women are meager, and tell us little about the sexual life. In three cases there are no facts available. One was thwarted by her father in a love affair when she was 20. One is reported as having been popular with the other sex when young. One is a girl of 16 who wished to be a boy, and has made no good adjustment to the other sex. One has always had admirers and recently has been interested in a married man.

Of the 21 males, 10 were married. Of these one was a case in which there were perverse sexual practices carried on many years

with boys. Two married women of lower social status. Three continued to be promiscuous after marriage. Two others had affairs after marriage but apparently only exceptionally. One whose wife did not give him the attention he was accustomed to was divorced and drank, and was also suspected of homosexual practices. One was recorded as affectionate towards his wife but suspicious.

Respecting four of the 11 unmarried, there are no data. Heterosexual relations are mentioned in four cases. In one of these, sexual adjustment was poor, there was nervousness and stress when he was stimulated sexually, and he could not meet the other sex on equal terms. In one case there was masturbation from an early age, and rich sexual fantasy. Four others showed poor adjustment. Masturbation and shyness and abnormal attachment to the mother was the difficulty in one case. One had embarrassment over sex. One was reported as playing with his genitals and exposing himself to girls.

Taking the group as a whole it seems that heterosexual adjustment of some kind is the rule, but that it is apt to be poor. In not more than two cases is there any satisfactory evidence of anything like a good adjustment in married life, and even in these it is said that married life was happy only for a time.

There is little direct evidence of homosexuality, and to what extent the poor heterosexual adjustment indicates homosexuality is not clear.

The sexual adjustment of the 18 unmarried is not satisfactorily recorded. In the cases of the women there is usually not much more known than the fact of the failure to marry. In the seven cases of unmarried males in which there is some fact about the sexual life, the conditions are varied.

Feelings of Inferiority or Insecurity.

The extent of the feelings of insecurity and inferiority in these cases cannot of course be definitely estimated from the kind of evidence available, but is indicated by a variety of the descriptive terms used by the informants. In general bad temper may be regarded as indication of sensitiveness and some form of insecurity, as are such reactions and traits as blaming others, lack of sense of

responsibility, seeking bad company, boasting, timidity, nervousness, bashfulness, seclusiveness, interest in buying friends, runaway tendencies, roving, asserting rights, invalid reactions, suspiciousness, resentfulness, jealousy, defensiveness, holding unpleasant thoughts, dependence, stubbornness, complaining of bad treatment, worry, bitterness, self-pity, tendency to criticize. Judged by such criteria as these, there is reason to believe that in at least 48 of the 50 cases there is some basis for the troubles in insecurity of some form. In the two cases remaining, there is no evidence that the states in question were not present, but only it may be said that the usual descriptive terms are wanting. In one of these there was said to have been a strong mother attachment on the part of a man, and in the other, a woman, there was at one time some depression. It may be concluded, therefore, that in these psychopaths, the informants have found worthy of note, in practically every case, characteristics which are ordinarily to be interpreted as indicating insecurity in regard to something.

Summary and Conclusions.

This study is a part of an orienting study of psychopathic personality, in which the records of 50 discharged cases of the Sheppard and Enoch Pratt Hospital were used as a basis. The materials had accumulated in the course of the ordinary clinical study of the patients.

There were 21 males and 29 females in the group.

Three main types are distinguishable, and for the purposes of this study classification according to these seemed sufficient. These are: (1) Delinquent type; (2) inadequate type; (3) general incompatibility type. There is a considerable variety among the incompatibles, but a fairly consistent general background of emotional instability and social ill-adjustment.

A cursory survey of these histories makes clear to the reader that the aggregate of trouble which has centered about these 50 persons is great. The type of reaction which the patient may have adopted early in life is very persistent despite all ordinary efforts to change it.

There is much psychopathy in the families of these patients. In 24 cases psychopathic personalities in the direct line could be

identified, or were strongly indicated. In seven more there was some form of psychopathy or neuropathy, and six of the other families were suspicious.

Physical examination shows nothing noteworthy except that in 13 cases there were signs of involvement of endocrine glands, no judgment being possible, however, regarding the priority of the physical as contrasted with the personality disorder.

Nothing outstanding appears from the enumeration of the occupational selections of these patients. The occupational history of the women is merged in the general history. Among the men occupations demanding little special training prevail and there is shown a tendency to change.

In 21 of the cases there was recorded either attachment to one parent or antagonism.

Twenty-two of the females and 10 of the males were married, or had been, but there was conspicuous lack of good marital adjustment; in only two cases was married life said to have been happy, and even in these it was reported only that it was happy for a time. There is little evidence of overt homosexuality, but histories are not very detailed regarding the sexual life, especially of the unmarried.

The most conspicuous fact observed in the study of the descriptive terms employed in the delineation of the personality in these cases was that in almost every case of the series there was evidence of attitudes relating to feelings of insecurity or inferiority.

The general conclusion is reached that the " psychopath " is one in whom strong demands are accompanied by feelings of inadequacy, inferiority or insecurity and in whom there develops a tendency to resort to one or more typical reaction patterns, different in different cases, but all to be included in a general way under the terms tantrums, sulks and running away.

THE ACUTE PSYCHIATRIC TYPE OF EPIDEMIC ENCEPHALITIS.*

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When one considers the extent and nature of the pathological process of epidemic encephalitis, it is not at all surprising that there occur definite psychoses in the victims of this disease. In fact, Abrahamson [1] states that the disease "causes typical mental symptoms which, I believe, are characteristic and present in every case." Wechsler [2] however, rejects the idea of any specificity of mental reactions in epidemic encephalitis, and regards them as manifestations of underlying infection or toxic delirium syndrome. Kirby and Davis [3] maintain that "the psychiatric problem of epidemic encephalitis belongs essentially to the realm of the organic, more specifically the toxic infectious mental reaction types." According to Jones and Raphael [4] the mental condition is variable, being an infectious-toxic one. These observers claim that the disease, from a psychiatric aspect, presents an early irritative stage in which the mental picture is not unlike that of other non-infective psychoses, and a later sub-stuporous period. Hesnard [5] calls attention to the changing mental pictures in the various cases of epidemic encephalitis, according to the evolution of the pathological process underlying the disease.

Various observers differ as to the classification of the psychotic reactions encountered in this disease. Tilney and Howe [6] group them under the heading of epileptomaniacal and acute psychotic types. Hohman,[7] describing nine different syndromes, groups them under four reaction types, namely: (1) Depressive, (2) psychoneurotic-like, (3) delirious and (4) organic. Kirby and Davis [3] after stating that the psychic disturbances of epidemic encephalitis present the characteristics of an acute organic type of mental reaction, elaborate upon the sleep disturbances, delirium, emotional reaction, motor phenomena, psychotic trends and general mental

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content of these patients. Heyman,[8] reporting the first five cases from the Manhattan State Hospital, groups them under the general heading of psychoses with encephalitis lethargica. His brief outline of the cases summarizes most of the reaction noted by the other observers. He states: "The onset in all cases was characterized by fever, complaints of headache, pains in the extremities and weakness, later showing double vision, eye-muscle paralysis and weakness or paralyses of the extremities. Two cases had difficulty in urination. Three of the cases were originally looked upon as cases of influenza and two as meningitis. The early mental symptoms in every case were those of an acute organic reaction of an occupational delirious type. There were auditory and visual hallucinations, mumbling and fragmentary talk, restlessness, with picking and purposeful movements, and later a period of stupor. At the time they were admitted to the hospital, these patients showed an acute confusion with misidentification, haziness and hallucinations."

Most of the psychotic reactions reported in the literature have occurred in patients after the disease had been fairly well established and has shown definite physical signs. It is remarkable how very few cases have been reported in which the psychotic manifestations were the first signs of this disorder. Kasanin and Petersen[9] reported four cases of epidemic encephalitis in which the psychosis was the earliest clinical picture, while the neurological signs developed later. One of their cases had an affective stupor, two cases showed the manic type of manic-depressive psychosis, and the fourth was diagnosed as schizophrenia. Only after the neurological signs had developed was the true nature of these cases discovered.

By the acute psychiatric type of epidemic encephalitis, I mean that group of cases that are ushered in by marked changes in the psyche, and which mask as psychogenic psychotic reactions. Only later, when neurological symptoms occur, is the real nature of the disease process recognized. The reactions in these cases are primarily those of an acute organic psychosis, so well described by Kirby and Davis.[3] The cases show either (a) delirium or (b) impulsive conduct, disorientation and confusion, dazed and bewildered states and marked fear reactions. While delusions and hallucinations are present, there are no specific trends elicited. The disease, however, may bring to the surface mental conflicts. The duration may be for several weeks or months, with recovery; al-

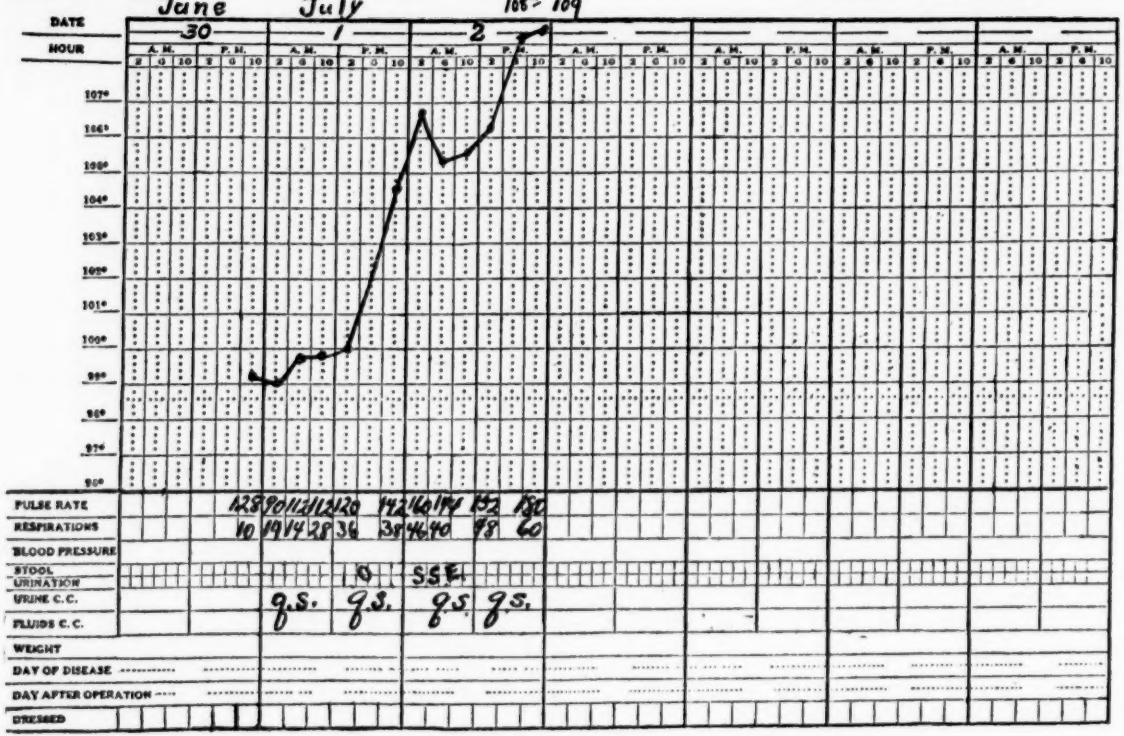
though death may ensue within a few days after the onset of the mental symptoms. The early recognition of this type of encephalitis is of extreme importance from a medical as well as from a sociological aspect. The early institution of proper therapy would contribute materially towards recovery. These cases could well be managed in a general hospital, if the correct diagnosis is quickly arrived at. It is a tremendous advantage to a convalescent patient as well as to the members of his family to know that he has been treated in a general hospital rather than in a hospital for mental disorders. Undoubtedly there is a stigma attached to one who has had a residence in a mental hospital, especially if committed by legal procedure. In case of the death of a patient in a mental hospital, the family often regard it as a blight on all of its members.

The first of these cases was observed by me in March, 1922, while I was on the staff of the Psychopathic Service of Bellevue Hospital.

CASE I.—E. K., age 38, white, single, insurance agent by occupation, was brought to the Observation Ward of Bellevue Hospital by the police. He had seized a woman on the street. She ran from him and called a policeman. They found the patient lying on the sidewalk bumping his head, greatly excited and agitated. When examined by me, he was very quiet and behaved in a very orderly rational manner. He gave a good account of himself and of his family. He could not remember the incident that had caused his arrest. In fact, he looked surprised when I told him what had happened. Suddenly he became terror-stricken, shouted at the top of his voice, and begged not to be killed. This episode lasted for about ten minutes, when he quieted and again showed good poise. Within an hour or two, the excitement recurred. He was rambling and facetious. He said, "You will have to bring them as a witness here. Don't kill me. I have no blemish on my character. There are matrons on the sidewalk hitting policemen. Why should they burn me? Help—help—don't kill me." His general physical condition was excellent. At first he had no evidences of any neurological disorder. Later, however, he showed sluggishness of pupils with some inhibition of deep reflexes. There were no pathological reflexes elicited. He was committed to a private sanitarium where he continued to show an impulsive conduct, marked fear reaction, and episodes of excitement and confusion. He had no fever, pulse was between 80 and 90 and respirations were normal. Ten days after the onset of his illness, he suddenly became unconscious, had a feeble pulse and poor heart action, and died within half an hour of the onset of coma. No post-mortem was obtained.

CASE II.—I. B., 24, female, white, married. Father died of diabetes in 1907. She had measles at the age of three and tonsillectomy at 12. Present

NAME I. B. WARD Rm 4 BED 1



illness dated back to June 17, 1924, when she had a sore throat. This condition lasted for one week. She then complained of pain in the right side of the body. She continued at work apparently feeling very well. On June 26, she suddenly became very excited and spoke incoherently. When I saw her, she was quite excited, rambling and impulsive. She expressed marked fear of death. She had been seen by another psychiatrist, who had diagnosed the condition as one of manic-depressive psychosis. On physical examination, no organic disorders were found. Her impulsiveness and marked fear reactions were quite unusual in manic-depressive psychosis, and I deferred the diagnosis. On the following day, her condition changed. She was still excitable, and her fear reaction was still marked. She kept asking whether she would get well, whether she would die, or if anything was going to happen to her family. She spoke irrelevantly and her mood was tense. There was no flight of ideas nor distractibility; no delusions and no hallucinations. She showed irregular and sluggish pupils; moderate congestion of the eye-grounds, and diminution of the deep reflexes. I then diagnosed the case as one of epidemic encephalitis.

She was admitted to the Brownsville and East New York Hospital on June 30, 1924, to the service of Dr. Dattelbaum. She had congestion of the pharynx. Heart and lungs were negative. Urine was 1.017, acid, showed trace albumin, negative sugar and no casts. She had 13,500 w. b. c. and 85 per cent polys. Blood Wassermann was negative. Blood chemistry showed urea nitrogen 12.5 mgs., creatinen 1.89 mgs., and glucose .183 mgs. per 100 c. c. Patient was excited and required restraint. There were generalized involuntary movements of choreiform and athetoid character involving the right side of the body more than the left. Pupils were decidedly irregular and sluggish to light and accommodation. There was paresis of the right side of the face. Abdominal reflexes were absent. Deep reflexes were unelicitable. She was distractible, shouting and screaming at the top of her voice, quite incoherent in her speech, and showed marked fear. She was completely disoriented. Temperature was 103° F. Pulse 120 and respirations 30. On the following day temperature was 105° F. She was excited and had to be restrained. A lumbar puncture was not done because of her excitement. Temperature on the following day went up to 108 and finally to 109. She became unconscious and death ensued. No post-mortem examination obtained.

Case III.—B. P., 32, white, single, school teacher, was seen by me on January 19, 1927, at the request of her cousin, a physician, who had asked me to examine her for the purpose of having her admitted to a mental hospital. Her parents are healthy quiet people of the Jewish faith. Her older sister is a school teacher. The patient has been teaching school for ten years and apparently has been getting along very nicely. For the last five years has been a faithful follower of Christian Science. She had never been seriously ill before. On January 17, 1927, she suddenly became excited and restless, sang and screamed at the top of her voice, and said that she was the daughter of Christ and that she was impregnated by him, etc. When

I saw her, she lay in bed in a more or less strained attitude. She would not look at me nor answer my questions. Suddenly she began to shout as follows:

"I am pregnant by the Lord. I am the Chosen Messiah. I obey only the Lord. I must not take any food because the Lord has told me not to."

Suddenly she became quiet, remained mute for about five minutes. Then she turned to me and said:

"Are you the Messenger of the Lord?"

Upon my responding in the affirmative, she said:

"Then I will do anything you tell me."

I asked her to take food, which she did for the first time in 24 hours. On physical examination, she showed a very well developed and well nourished condition. Heart and lungs were negative. The pupils were very widely dilated, equal, regular in outline and reacted sluggishly. There was no diplopia. Abdominals were present. Her knee jerks were definitely diminished. There were no pathological reflexes. The impulsiveness, delusions, and the silly excitement in the presence of rather sluggish pupils and diminished reflexes led me to believe that we were dealing with an acute organic psychotic reaction rather than with that of a psychogenic psychosis. In view of the absence of infection or trauma, I diagnosed the case as that of epidemic encephalitis. The patient continued in a state of excitement for three days. She then became drowsy, had diplopia, pupillary irregularity, and inequality of the knee jerks. She remained in this condition for about three weeks, when improvement commenced. She ran a typical course of epidemic encephalitis.

The delirious type of reaction is represented by the following case:

CASE IV.—L. R., 39, white, married, was admitted to the Brownsville Hospital on May 7, 1924, and discharged on July 29, 1924. The family history was negative. According to the history, the patient began to complain of drowsiness the latter part of March, 1924. He also complained of burning sensation in the eyes. He felt that he could not do his work as well as formerly. On April 15, he returned home from work and stated that he could not see, became quite excited and was put to bed. The blindness lasted for three days, when he recovered his vision and returned to work. On April 22, he suddenly became excited and delirious, and talked incoherently about business transactions. On May 1, he became quieter, but was still restless and non-cooperative. He was brought to the hospital on May 7. On examination patient was confused, restless, and disoriented in all fields. He spoke of being at work and of selling his merchandise. He showed unequal pupils, engorgement of the retinal vessels and increased deep reflexes. Slight rigidity of the neck was present. His spinal fluid came out under three plus pressure, showed negative globulin, three cells, reduced Fehling's solution, negative Wassermann and colloidal gold curve of 0011123444. It showed no organisms on smear or culture. His white blood count was 12,600 with 79 polys. His red blood count was 3,900,000 with

65 per cent hemoglobin. Urine showed trace of albumin. Blood chemistry showed glucose .125 mgs., Urea N. 13.5 mgs., and creatinin 2.0 mgs. per 100 c. c. His temperature was 100.8° F., pulse 98 and respirations 26. Patient's condition continued to be that of mild delirium with confusion. He would offer his merchandise for sale and would give lectures on how to sell his goods and how to meet customers, etc. On one occasion he delivered a speech which was supposed to be a eulogy on one of his partners. On another occasion he was delivering a speech at a supposed banquet. He had to be kept in mild restraint. His pupils were unequal, the right larger than the left. There was decided sluggishness to light and accommodation and consensually. The left knee jerk was more active than the right. There was slight left facial weakness. There were no pathological reflexes. On May 21, his temperature rose to 104.8° F., pulse 108 and respirations 46. He then had a scarletiniform rash all over the body. He became somewhat quieter but was still irrational. Temperature continued until May 26, when it came down to 103. It remained at this level until June 2, when it came down to 101° F. At this time he had several pustular eruptions on the back. On June 19, a rectal abscess was discovered which was discharging pus containing staphylococci. As soon as the abscess was incised, his condition gradually improved. He became more rational, spoke more coherently, and his general attitude was changed. His wound healed on July 25, and he was permitted to go home on July 27.

Patient has been reporting to me at regular intervals. I saw him on May 6, 1927. He gained considerably in weight. He showed a decided Parkinsonian expression on his face. His pupils were fixed, right larger than the left, and both were irregular in outline. There were no pathological reflexes elicited. He complained of drawing sensations in his muscles. He said that he was able to conduct his business as a store-keeper fairly well. The only difficulty that he was experiencing were the peculiar muscle pains all over his body.

CASE V.—A. S., 42, white, married, jewelry salesman by occupation. Family history was negative. Personal history was of no significance. The patient had influenza in January, 1923, and was in bed for one week. In the early part of February, 1923, he went on the road as a salesman. On February 20, he felt that his tongue had become thick, and experienced an intense headache. He was then on a train, and was taken off at Nashville, Tenn. On the following morning he became very excited and delirious, and lost his speech. He resisted all treatment. He was brought home from Nashville, Tenn., being kept in restraint while en route.

When I examined him in the early part of March, 1923, he showed a definite motor aphasia. He had unequal pupils, right larger than the left, and both were fixed to light and accommodation. There was congestion of both eye-grounds, and there was a decided blurring of the left disc. The tongue protruded slightly to the left. There were diminished reflexes on the right side of the body. There was an indefinite right Babinski, and the right abdominals were diminished. There was moderate cervical rigidity and slight Kernig. His blood count was normal and urine was negative. The

spinal fluid came out under pressure, showed six cells, trace of globulin and Fehlings was reduced. The colloidal curve reduction and Wassermann were negative. His blood Wassermann was also negative. Mentally he was very resistive, and he was constantly trying to leave his bed. On one occasion he almost succeeded in throwing his nurse out of the window. On another occasion he grasped the arm of his oldest daughter and tried to break it. He continued in this condition until May 10, 1923. His temperature never went above 100° F. His pulse varied between 80 and 110. His respirations were between 16 and 30. About May 10, there was a slight improvement in his condition. He became quieter and more amenable to care and treatment. He then began to say an occasional word and to make himself understood. There was considerable improvement in his general physical condition, and he was discharged from my care on May 20, 1923. He reported to me at regular intervals. His speech improved considerably, but never fully. He returned to his work September 15, 1923. He explained his original excitement by the fact that he had visions of Hindoo images choking him. He tried to throw the nurse from the window thinking that she would kill him. He had a delusion that his daughter had been ruined by some man and he wanted to kill her. He was examined by me on May 8, 1927, and he then showed a decided Parkinsonian expression on his face, with an incipient tremor in the left upper extremity. The right palpebral fissure was larger than the left. The right eye-ball was very prominent. The right pupil was larger than the left, both were irregular and both reacted sluggishly to light and accommodation. His speech was still dysarthric. He mispronounced words and at times would find it very difficult to express himself. He would become particularly unintelligible when subjects of deep emotional nature were discussed. He was a man of great verbal imagery and he now finds it rather difficult to express himself. He is, however, employed, and is self-supporting.

As pointed out by Kirby, there were many cases of acute psychosis which were not recognized as encephalitis disorders until the brains were studied at autopsy. The following case is illustrative:

Case VI.—B. C., 28, female, white, single. Admitted to Jewish Hospital on August 31, 1925, and died September 1, 1925. Family history was negative. Personal history disclosed that she had measles and scarlet fever at six, and typhoid fever at 13 years. Menstrual cycle was normal. Her present illness dates back to August 23, 1925, when she began to feel ill. She had aches and pains all over her body. On August 25 she commenced to have intense generalized headaches which were not relieved by any medication. On August 29, she took her temperature, and it was 103.5° F. She was taken to the hospital. On admission she showed an absolutely negative physical condition according to the chart. Her lungs and heart were negative. The cerebro-spinal nervous system was normal. Her urine showed faint trace of albumin. There were 7800 w. b. c. with 67 per cent polys. Blood Wassermann was negative. Her temperature on admission was 102, pulse was 100 and respirations 22. On the following day her temperature went up to 103,

pulse 104, and respirations 28. Temperature before death went up to 103.8. Her Widal Para A. & B. and Felix-Weil were negative. According to the nurse's notes the patient acted irrationally from the very day of admission. She was rambling, irritable and distractible. She spoke incessantly about herself in a rambling manner and showed considerable fear. She repeatedly asked to have the window kept open. She then asked the nurse to step out of the room since she could not sleep with a stranger in the room. The nurse complied with her request and left the room, when she suddenly heard a noise. On returning to the room she found that the patient was not there. The patient had jumped from the window, and fell a distance of three stories. She died within two hours after the accident.

Autopsy No. 499 revealed laceration of the lung, liver and spleen. There were cloudy swellings and edema of liver and kidneys. The brain was examined carefully, and it showed marked congestion with considerable pin-point hemorrhagic areas in the pia. Microscopic examination revealed clear-cut epidemic encephalitis pictures in the sections from the frontal lobe, thalamus and pons. The vessels were engorged, and there was infiltration of the Virchow-Robin lymph spaces with lymphocytes and plasma cells. Several vessels were ruptured, and there was considerable hemorrhage present. There was cloudy swelling of the ganglion cells with moderate chromatolosis and satillitosis. There was moderate neuroglia reaction.

Occasionally the psychotic reactions appear concomitantly with the physical signs, in which event the diagnosis is fairly easy. The following cases illustrate this point:

CASE VII.—H. C., 32, white, single. Complained of pain in the left shoulder and of headache. He was seen by a private physician who diagnosed his case as that of high uric acid content of the blood. He was put on colonic irrigation. On the second day of treatment he collapsed in the physician's office and was taken home. I saw him on the same day, March 19, 1927. He was quite restless. He attempted to get out of bed and had to be restrained. There were definite myoclonic as well as atheto-choreiform movements in the left upper extremity, the left side of the chest and the left lower extremity. He complained of intense pain in the limbs. Physically he showed somewhat irregular sluggish pupils, congestion of the eye-grounds, atheto-choreiform movements of the left extremities, sluggish abdominals and a left Oppenheim. There was marked rigidity of the neck and a moderate Kernig. Mentally he was quite restless, distractible, impulsive and disoriented. He said:

"I am in the trenches now. Did you see the aeroplane? Are they going on a raid? What was it—am I gassed? When did I come? Is this France? What is it—1918? Gee, I got a terrible headache. Look at the muscles—see them dance?"

He did not recognize his family nor his fiancée. The mental reaction in the presence of the physical findings made the diagnosis of epidemic encephalitis rather easy. The spinal fluid was examined, and showed five

cells, faint trace of globulin, Fehlings reduced, no organisms in smear or culture, and negative Wassermann. Blood Wassermann was negative. Blood count was normal. Urine showed an occasional faint trace of albumin. His temperature was 100.2° F., pulse 80, and respirations 28. On the following day he became drowsy and had ptosis of the right lid, very sluggish right pupil and congestion of the eye-grounds. The involuntary movements of the left side subsided. He continued a more or less drowsy state for ten days when his condition gradually improved. Only once during his illness did he complain of diplopia. After four weeks he made a fairly good recovery.

Case VIII.—F. M., 30, white, married, and has two healthy children. Family history is negative except for the fact that one brother died from encephalitis at the age of 30, two years ago. Personal history is normal. Present illness dates back to February 1, 1927, when patient complained of general weakness and intense headache. Since February 5, there was persistent insomnia. She commenced to act rather strangely, became suspicious and irritable, and complained that people were talking about her. On February 7, she had a generalized convulsion and this was repeated on the following day. On February 11 she was admitted to the hospital complaining of intense headache, restlessness and irritability, and of hearing all sorts of voices. On examination the patient showed definite cervical rigidity and moderate Kernig. Pupils were decidedly irregular and both reacted sluggishly. There was a bilateral external rectus weakness. There were active abdominals. There was generalized hyperreflexia. There was bilateral spontaneous extensor toe phenomena. There was marked vasomotor instability. Her temperature was 99, pulse 104 and respirations 24. Blood count showed 7800 w. b. c., 68 per cent polys., 4,100,000 r. b. c. and 85 per cent hgb. Clear spinal fluid was obtained under three plus pressure, showed a trace of globulin, ten cells and no colloidal gold curve reduction. Fehlings was reduced. The blood and spinal fluid Wassermann were negative. Urine was negative, except for faint trace of albumin. The patient remained in a more or less confused state and was very evasive and suspicious. She would not permit examination at times. She asked the nurse repeatedly if someone was going to kill her. She would not sleep nights. Her temperature remained at 99° F. The pulse varied between 88 and 100, and respirations between 16 and 24. She was finally discharged from the hospital on March 3, 1927. I saw her again on April 4, 1927. She then showed decided masking of her face with diminution in her winking reflex. Her gait was decidedly of Parkinsonian type. There was impairment of the voluntary associative movements. There was decided left internal rectus weakness. The pupils were equal, somewhat irregular in outline but very sluggish, both to light and accommodation. Mentally she admitted auditory hallucinations and persecutory delusions. She said:

"I hear ear phones telling me that everything is O. K. and my husband, my home and my children are well. I remember you in the hospital. Tell me the truth, didn't you try to kill me? You wanted to poison me, didn't

you? I still hear peculiar voices in my ears. These voices guide me and tell me what to do. They are human voices. They advise me what to feed my children and what to do."

Occasionally epidemic encephalitis may occur in an individual who has once had a frank psychosis, in which event the diagnosis is indeed very difficult. The tendency naturally is to regard the two reactions of identical nature. The following case is illustrative:

CASE IX.—A. W., 30, married, admitted to the Brownsville Hospital on January 27, 1926, and transferred on January 29, 1926, to the Kings County Hospital. According to the history the patient married at twenty, and became a widow with two children at twenty-six years of age. After the death of her husband she became excited and acted irrational for four months. She was treated at home. She gradually improved and finally made a thorough recovery. She then remarried. The second husband was very kind to her and her children. Lately he lost considerable money in Florida due to dishonesty on the part of his partner. The patient was well until two days ago when she complained of a headache which was not relieved by medication. She was sent to the hospital for observation. On admission the following notes were made: "The patient is well developed and well nourished. No physical disorders present. Mentally she shows signs of definite psychotic reaction. She had a similar attack four years ago which lasted for several months. She is very excitable, restless, screams, fights and resists all attention. She says spontaneously:

"I am a physician; I am a great singer" (patient sings a popular air). "Kiss me, sweetheart; don't you love me? I am all right. Those devils robbed me of my husband. I am fine. I am a beautiful woman," etc.

My impression was that she was suffering from a manic depressive psychosis, especially in the absence of any physical signs, and in the presence of a history of a former mental attack. She was transferred to the Kings County Hospital Psychopathic Ward. There she showed restlessness, excitement, delusions, and, occasionally, hallucinations. Temperature was 102, pulse 80, respirations 20. There were 6100 w. b. c. and 74 per cent polys. Spinal fluid showed increased pressure, six cells, trace of globulin and 71 mgs. of sugar. Spinal fluid and blood Wassermann negative. Colloidal gold was 0121100000. After being observed there for one month, she was discharged with a diagnosis of psychosis with epidemic encephalitis. She was then taken to the Polyclinic Hospital where she was treated for six weeks, finally developing ocular palsies and other neurological signs present in epidemic encephalitis. She made a complete recovery from the acute phase of the disease.

SUMMARY.

Epidemic encephalitis is an infectious disease of as yet unknown etiology, but of a well-established pathology. The cerebro-spinal

nervous system, especially the brain, bears the brunt of the infection. The anatomical picture is characterized by marked congestion and edema, infiltration of the Virchow-Robin lymph spaces by lymphocytes and plasma cells; distension and occasional rupture of vessels resulting in hemorrhage; moderate cloudy swelling of the ganglion cells with chromatolysis, satillitosis and occasionally neurononphagy; and moderate neuroglia reaction. The pathological process is a changing and progressive one. The mental picture results from the action of the encephalitic virus and inflammatory exudates upon the nerve tissue. The clinical reaction, therefore, may be that of an acute organic psychosis in which there is a constant changing of symptoms. Occasionally the toxemia may bring to the surface deeply rooted mental conflicts, adding a psychogenic coloring to the presenting symptoms. The encephalitic virus may first attack those parts of the brain that control the highest psychic processes (frontal lobes) and may produce a psychosis as the earliest clinical manifestation. The early recognition of these cases are of tremendous medical and sociological importance.

CONCLUSIONS.

1. Epidemic encephalitis may first manifest itself in an acute psychotic reaction.

2. The psychosis is that of an acute organic psychosis. This may be either a delirium or of an occupational nature, or of episodic outbreaks of silly excitement, impulsive acts, delusional or bewildered states, confusion and marked fear.

3. The subsequent appearance of neurological symptoms help to arrive at the correct diagnosis.

4. A review of the literature and illustrative cases are presented.

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ENCEPHALITIS LETHARGICA AND THE INTERPRETATION OF MENTAL DISEASE.*

By IVES HENDRICK, M. D.

The significance of encephalitis lethargica extends far beyond the mere classification of a recently recognized clinical, pathological, and infectious entity. In the study of this disease, we find a common meeting ground for those who are convinced that all psychiatric disorders are essentially changes in either the structure or physico-chemical functions of cellular units, and those who contend that the nature of psychological processes is a unique biological mechanism. The infectious etiology of encephalitis is clearly demonstrated. Convincing evidence of the persistence of the virus after the acute phase is being presented, especially by Wimmer [20, 21] and Freeman.[21] Neuropathology has conclusively shown: first, the multiplicity of the anatomical lesions; and, secondly, the preponderant frequency of injury in certain regions, notably in the mesencephalon. This diversity of somatic lesions help us to understand the varied clinical pictures; of more ultimate value should be symptomatic studies which reveal, more exactly than has been hitherto possible, the function and mechanism of the brain areas affected. We have yet to realize completely the prophetic words of v. Economo,[18] "encephalitis has given us an unexpected insight into the psychological and physiological mysteries of mental mechanism, ... and brings to us a better understanding of the psychoses and the neuroses."

Encephalitis offers a definite psychiatric situation in which we can accurately delimit the period of disease from the preceding period of mental health in a large proportion of cases. Bond and Partridge [9] have remarked that no other diseases produce so abrupt a behavior change except cerebral trauma, and possibly chorea and syphilis. But even in these other conditions, mental deterioration is so rapid, and the similarities to "functional" disease so much

* The clinical study incorporated in this paper was made at the Boston Psychopathic Hospital, C. Macfie Campbell, M. D., Director.

less frequent, that encephalitis undoubtedly presents a far more fertile field for constructive analysis of aberrations of the personality and emotions. We may, therefore, expect that a comparative study of the pre-encephalitic and encephalitic periods in a series of cases will illuminate considerably several fundamental problems. The differentiation of the rôle played in encephalitic syndromes by somatic factors, from those produced by environmental stresses, should clarify our conception of other diseases.

Increasing interest is being shown in this promising field. Jeliffe [21, 22, 23] has attempted to define the degree in which symbolic substitutes for wish-fulfillments will explain the psychological manifestations of encephalitis. His studies are made by psychoanalytic technique, and his interpretations adopt its terminology. Consequently, some of his statements may be expected to sound ultra-visionary to us who temper our homage to the contributions of his school with a conviction that the possibilities of more venerable methods of science have not been exhausted. For example, he believes [23] "it may not be too hazardous to state that a part of the psychodynamics of the salivation represents an orgasm"; and furthermore, that dream evidence indicates the "dissolution of function, the greasy skin and trance are regressions signifying return to the womb complex." But the partisan enthusiasm for Freudian formulations which is implied in his statement [23] that the study of pathology is very rudimentary because it offers no real interpretation of "*my platform*" should not blind the non-analytically disciplined to the fact that Jeliffe's studies of encephalitic psychology constitute the most thorough attempt which has yet been made to utilize the rich potentialities of encephalitis for the solution of psychopathological problems. His own extensive researches are the basis for such conclusions as these: [21] "For both the hyperkinetic schizophrenic manifestations [of encephalitis] as well as for the content of the psychotic ideas, it may be granted that blocking of telencephalic or higher coördinates (normal? behavior) may take place from dissimilar causative factors and that positive and negative behavioristic activities appear. There never can be much doubt that similar structures are involved, but they are involved as results of different causative agents in different degrees." Essentially, he insists upon the psychogenic roots of the personality as determinants of chronic encephalitic syndromes, and the futility

of a dualistic approach to these problems. He says:[21] "If one really deals with a psychobiological conception of the human body, the fine-spun polemics as to differences between psyche and soma, or body and mind, have relatively little significance. One does not change a human being's action patterns in their *wish capacity* by any type of pathological process." It is chiefly his cosmic outlook, his insatiable urge to synthesize all attitudes toward human life—the most advanced psychoanalytic theories, demonstrable physicochemical properties and possibilities, neuropathology and metaphysics—that handicaps Jeliffe in demonstrating a few simple and fundamental truths which those not admitted into the Inner Temple of the "Ultra-Eruditi" can comprehend.

Pierce Clark[24] ingeniously incorporates the somatic factor in his psychoanalytic explanation of encephalitic maladjustment by regarding the brain as the domicile of the "ego." Thus injury to the brain produces mutilation of the ego, and there results an "organic neurosis" which differs from a narcissistic neurosis only in that it is "more deeply set into the structural pattern," and "organically conditioned." "We must look upon the lesion here as one that singularly wounds the psyche and personality of its victim, not in a somatic or physiological sense but in a psychological one."

The psychoanalysts are not alone in stressing the importance of personality components in the production of the clinical picture. Burr,[13] for example, says: "This case shows the influence of the soil, the kind of protoplasm one is born with, in determining the results of an acquired disease. . . . . My final conclusion was that the paralysis agitans syndrome was the result of epidemic encephalitis, but that the dementia would have appeared sooner or later in any event." Hinsie[25] says: "The clinical picture is not made up solely of factors sharing their origin concurrent with injury of somatic structures." Bond and Partridge[9] call attention to the fact that the purely neural theory implies that changes in behavior can be attributed to definite physical changes, and the localization of these changes is inferred from the neural signs, especially those of the Parkinsonian syndrome. But they conclude "that personality elements and environmental factors enter in varying proportion to combine with the organic elements . . . . in determining the be-

havior pattern. . . . . We can relate functional changes with localization of morbid processes in the corpus striatum with some little confidence, [but] there is no reason to suppose that cortical lesions occur which have anything to do with the development of the behavior reactions."

Natrass [42] takes a very different view when he ascribes the weakness of facial expression and the peculiar post-encephalitic sighing solely to pathological damage in the pons and medulla. The exclusion of psychological factors from consideration is also implied in the attitude of Barker,[5] who says, "the psychotic types doubtless depend on diffuse toxic disturbance or multiple foci of infiltration in the telencephalon." Wimmer,[51] though not unmindful of the fundamental influence of the personality, stresses even more emphatically that the fundamental feature of chronic encephalitis in its various forms is the extra-pyramidal syndrome; this is most clearly manifest in the increased activity, which seems to him a form of hyperkinetic behavior fundamentally similar to the hyperclonus of the Parkinsonian. Gordon [23] also displays a neurological orientation toward psychotic phenomena, when he says: "The impression may be gained especially in the Parkinsonian types that there is a posterior depressive psychosis, but in reality the mental condition is an akinetic expression in the psychic activities analogous to akinesia in the motor sphere. In all such cases the mental processes run parallel to the motor phenomena." Gertsmann and Kanders [22a] take a somewhat similar view, and believe that the impulsive behavior is not primarily a mood elevation, but a failure of the function of memory and volition to check the stimulus to impulsive activities, and in that sense it is a primitive regression in the motor mechanism. Collin and Requin,[15] and Mackenzie,[28] emphasize the fact that in the small child encephalitis produces essentially an arrest of mental development, in the adolescent a release of the impulsive emotional behavior, and in the adult, predominantly a dysfunction of the extra-pyramidal motor pathways. In order to explain this disparity of reaction, they recall that maturity is reached at very different ages by different portions of the encephalon. Thus, mental abnormalities may be due to the absence of certain pathways, when the disease has eventuated before their development; and to the failure of inhibition when the pathways are already mature. Clarke [11] also refers to the ontogenic

determinant. Hall's attitude [25] is that when mental symptoms appear there has been damage to a much wider area than appears in the Parkinsonian.

It is clear that investigators have not yet been able to present conclusive evidence that the changes after encephalitis are due solely to organic damage. We ourselves feel that a useful working hypothesis for a study of the personality changes should recognize tentatively the following principles: that a disease process has occurred which affects the individual's ability to adjust himself to instinctive and environmental stresses; that the greatest structural damage has involved the corpus striatum; that this region controls certain instinctive reactions of motor and emotional exhibition; and that our present knowledge of the normal physiology of the basal ganglia and of their anatomical connections with the cerebral cortex is too inadequate to enable us to assert definitely that the pathological behavior of encephalitics is due exclusively to the lesions of the basal ganglia, and not to those of the forebrain. With this formulation posited, we will consider: first, whether encephalitis produces in some cases an essential change in the warp and woof of the patient's personality, or whether it produces essentially an exhibition of old personality elements liberated as a result of damage to normal inhibitory mechanisms; and, then, compare the symptoms of encephalitis with those occurring in certain other psychoses whose etiology is not understood, and especially with schizophrenia.

In reviewing the mental changes which epidemic encephalitis produces, we shall not discuss such symptoms of the acute phase as stupor and delirium, and shall concern ourselves with alterations of personality and behavior. Many observers have commented on the great variety of the alterations of personality and behavior in the chronic stage, and agree on the great diversity of the symptoms and the absence of definitely defined categories. Natrass [26] gives a simple and purely organic classification, including a group in which the higher cortical centers are chiefly affected; and Wimmer [27] considers the mental as well as the physical symptoms as "hyperkinetic," "hypokinetic," and "mixed" forms. Bramwell [28] and Hall [25] are concerned chiefly with aberrations of behavior, and classify their cases as "imbeciles," "the Parkinsonians," "the

Apaches," and "the difficult children," the last two classes being arbitrarily distinguished by the seriousness of the reaction. Goodhart [33b] describes a "Parkinsonian," an "excitomotor syndrome," a "true hypomanic type," a "respiratory type" and a type with "night restlessness," and is tempted to add a separate group for disorders of behavior, evidently feeling that its manifestations should not be included with the "excitomotor" group. Kennedy [35] also names three types, characterized respectively by disorders of respiration, Parkinsonian disease, and nocturnal hyperactivity, and includes all others under the title "changes in personality and behavior." Mapother,[11] whose study is based upon 15 psychotic cases in the Maudsley Hospital, classifies them simply as mental anergia, morbid restlessness, and demoralization. Hesnard [37] groups his cases as those who show mental syndromes of the common neurologic types, usually only lethargy or mild confusion, and those with "encephalitic psychopathies," viz.: psychosomnolent form, lucid catatonic stupors, acute delirium, confused form, Korsakoff form, miscellaneous. Kirby and Davis [38] describe three mental reaction types: organic; affective, essentially manic-depressive patterns; and trend reactions, such as schizophrenic and paranoid states. Riddoch [46] mentions an "asthenic syndrome" which is frequently confounded with psychogenic disorders. Auden [23] attempts no pedantic divisions, accounting for all personality and behavior changes on a common basis of increased emotional instability with a reduction in volitional inhibition. Hohman [30] recognizes nine "syndromes": "push of talk," "euphoria," "exceptional alertness on being aroused," "delirium, stuporous condition," "behavior oddities," "depression," "emotional instability" and "irritability," and "memory defect." He summarizes these under four "reaction types": (1) "the depressive"; (2) "the psychoneurotic-like"; (3) the "delirium"; (4) the "organic." In a later paper [29] he refers to changes in behavior, sleep alteration, over-talkativeness and tics.

We find the more complex of these nosologies neither convenient nor scientifically interesting. Consequently, for our own purpose of considering essentially psychiatric conditions in patients of all ages, we have classified our patients in three simple groups: first, a group characterized by augmented psychomotor or antisocial activity including the Apache and difficult children of Bramwell

and Hall, those with restlessness and sleep inversion, "excitomotor symptoms," instability of mood, explosive behavior, irritability, and excitement. In this group are included most of the behavior disorders of an impulsive or antisocial nature which are especially characteristic of the encephalitic—running away, assaults, destructiveness, and suicide. Secondly, we group together those which Barker [8] speaks of as "aping" the functional psychoses and Kirby and Davis [20] as "trend reactions"—those which simulate closely such psychoses as schizophrenia, hysteria, or paranoia. In this group there is definite distortion of the personality; persistent delusions are especially common, hallucinations frequently occur, and behavior and speech is often symbolic. Thirdly, the post-encephalitic's "inferiority neurosis," in which the essential mental feature seems not so much the disease process itself, as a reaction to the oddity of appearance and movements which result from neurological crippling.

Our series of cases are derived from 21 patients discharged from the Boston Psychopathic Hospital in 1926 with a final diagnosis of "encephalitis lethargica." We have excluded from our study six of these patients. Four (R. H., E. A., A. F., A. K.) were acute cases with no mental symptoms except delirium or stupor. One (M. S.) was a typical Parkinsonian, whose behavior, except for a transient trick of turning the eyes upward, according to the history, was mentally normal. One (A. S.) was a case whose diagnosis was questionable. She had a history of influenza, but not of encephalitis, and, with the exception of a very slight immobility of the facies and doubtful impairment of associated movements, was without post-encephalitic symptoms. Furthermore, her psychosis consisted of violent seizures with rotation of the eyeballs of typically hysteriform character, whose psychogenic determinants were clearly demonstrated. The mental symptoms, therefore, were not characteristic and did not in themselves warrant a diagnosis of encephalitis.

Of the 15 cases studied, 10 were diagnosed "with psychosis," four "without psychosis," and one "with psychosis" at his first admission and "without psychosis" subsequently. As behavior or personality changes were present in all, however, this distinction is quite academic. Thirteen of the cases were considered chronic;

in two cases the psychotic symptoms had first appeared one to six years after the acute attack; in eight, behavior symptoms had continued for periods of six months to six years, although there had been no quiescent interval between the acute illness and the chronic manifestations. In three other cases, there was no history of a definite acute attack. And two cases (R. F., G. N.) were classified as acute because of the constant presence of the encephalitic process since the onset less than two months before admission. Two cases were admitted twice.

We consider that in this series a strong probability of encephalitis has been demonstrated in all cases. We have not, however, adopted any arbitrary criteria, but in each patient have considered the clinical picture as a whole. A history of encephalitis has been considered authentic, when the diagnosis was made during previous hospitalization at a first-class institution; or when there has been a history of an illness of several months, with such characteristic features as periods of delirium or lethargy, neurological changes, especially diplopia, strabismus, or tremor, transient paralyses, choreiform movements, delusions or hallucinations. In nine of our cases these criteria have been fulfilled. In other cases the diagnosis was made without history when neurological signs such as immobility of the facies, definite and often fluctuating abnormalities of the pupils or extraocular muscles, a definite tremor, especially when coarse and enhanced by purposeful movement, defect of automatic associated movements, and often increased muscle tonus, change in the reflexes, gait and speech were unequivocal. In nine of our 15 cases, in addition to mental symptoms, these signs have been sufficiently definite to warrant a diagnosis of Parkinsonian disease; in all other cases there have been some of these changes, but less pronounced and numerous. A personality change, often abruptly following an illness, especially when characterized by impulsive actions, sudden mood changes, wandering spells, and night restlessness, is considered good corroboration of the diagnosis. One case (I. G.) gave a history of severe influenza, but not encephalitis, in 1918; since then she had been nervous, irritable and forgetful. In 1925 there was an acute illness with severe headache and subsequently explosive rages, marked irritability, wandering episodes, and many delusions. We found moderate inequality and sluggish-

ness of the pupils, and .095 gm. of sugar in the spinal fluid. We considered this evidence ample for a diagnosis of encephalitis. The increase in the cerebrospinal sugar (over .085 gm.) found in this and on one other case (R. F.) is regarded of only incidental value in the diagnosis. In another case (R. F.), the impulsive behavior and explosive emotional reactions in a person previously stable and placid, was considered characteristic of encephalitis, although other diagnostic features were quite indefinite—a little fatigue, some confusion, slight disparity of the pupils, hyperactive reflexes, and a coarse tremor. In one case (N. D.) only the diagnosis is open to reasonable question. Her psychotic picture was that of a paranoid condition, some might say a true paranoia, with additional definite features of "hysteria" in the opinion of some members of our staff. The patient herself, an intelligent woman, gave a history of having had "encephalitis" in 1920, but she did not describe the symptoms. Slight paralysis of the face and hands four months prior to admission had been diagnosed "Parkinsonian disease" at the Massachusetts General Hospital. These neurological signs had since receded and on admission only a slight suggestion of the Parkinsonian gait, irregular pupils with practically no reaction to light and accommodation, and an impairment of convergence, were apparent. In all other cases, diagnosis was still more certain.

The frequency of some symptoms in this group differs considerably from the reports of other observers. This is partly explained by the facts, that our cases cover a wide age period, whereas many of the previous studies have been made only on children and young adolescents; and that very few cases are brought to this hospital unless there is such a predominance of psychotic symptoms as to unfit them completely for community life. In the carefully selected cases studied by Bond and Partridge* physical residuals were trifling; and there is considerable agreement among other authors that these do not constitute a prominent part of the total picture in psychiatric cases, especially in young patients. Our unselected group, however, shows a large number of important neurological findings, which we have mentioned in our discussion of the diagnosis. For seven of our cases had definite signs of Parkinsonian disease, and all of these were under 33 years of age, and five under 21.

The opinion has also been frequently expressed that impairment of the intellectual functions is rare, except in very young children. In only one of Bond and Partridge's [9] 12 selected cases was there a progressive impairment; but this was shown exactly by a reduction of scores in psychometric tests given at different periods. In Sherman, Mandel, and Beverly's 20 cases [1] from 8 to 17 years of age, no evidence of mental deterioration was revealed by psychometric tests. They found that, although poor memory was a common complaint, it was not revealed by psychometric examination; that school grades corroborated the psychometrics; and they consider other observers have been misled by disorders of attention and mood. Hohman [20] found a memory defect was rare. Kennedy [25] found in eight out of 23 cases no intellectual impairment. Kwint [27], applying "standard tests" to 13 young patients found six normal, four one year retarded, and three, two years behind. Bebb [6] in a special study of 21 cases found an apparent memory deterioration, especially when remote events and more complicated processes were involved, and suggests that the failure is due to affection of the motor areas rather than a slowness of perception.

The most thorough study of this matter was made by Dawson and Conn [11] who conclude: "The average intelligence [determined by the Binet-Burt test] of 46 children suffering from the after-effects of encephalitis lethargica was significantly lower than that of 974 other hospital patients and their own brothers and sisters. The mean intelligence of those whose illness had lasted over 12 months was significantly lower than that of patients whose illness was of shorter duration. The average intelligence of 30 of these patients who were retested after intervals varying from 7 to 36 months showed a significant deterioration at the second test. This deterioration seems to be due to arrested development. . . . . There was no significant difference between the intelligence of the 29 patients showing disturbances of character and emotionality and that of the remaining 17." An interesting suggestion in the interpretation of intelligence tests is made by Shrubsall: [47] "Many children do well on tests which can be done rapidly, but they fail at those which require prolonged concentration."

In nine of our 15 cases either deterioration of the higher mental faculties was observed in the hospital, or there had been a serious

difficulty with school work which could not be accounted for by the psychotic symptoms. Seven of these cases were between 12 and 23 years of age, one was 33 and one was 53; one patient had been nine, and the others more than 12 years of age at the time of the acute stage of the disease. One of these (R. F.) was an acute case, and in another (E. G.) the defective intelligence probably antedated the disease. In the other six, G. N. had, since her illness, done very poorly in school, failed to gain promotion, and had an I. Q. of 78; J. Q. complained of being unable to think so well as formerly, and showed some memory inpairment with an I. Q. of 88; G. J. was confused and disoriented, with an "unrepresentative" I. Q. of 58; P. S. had shown "poor comprehension" in school and had an I. Q. of 74 and performance test rating of D; S. F. had a definite memory impairment; V. A. had shown in Allentown Hospital marked impairment in remote, retentive and recall memory; J. B. had shown a marked decrease in school ability, inability to comprehend instructions in simple labor, failure in many subjects. In this case, however, the deficiency may be attributed to somnolence rather than actual intellectual damage, for his I. Q. was 88 per cent.

And so, although we agree with the consensus that intellectual damage does not generally constitute the most conspicuous feature of chronic encephalitis, our material indicates that a moderate impairment, sufficiently serious to constitute one of the difficulties of environmental adjustment, is more common than has been generally supposed.

We also find a much larger proportion of psychoses with such symptoms as hallucinations, delusions and negativism, and a more frequent simulation of the "autochthonous psychoses" than most other observers. Mental distortions of this type, and simple mood disorders, such as elation and depression, were outstanding features of six of our cases. Seven of the 15 had definite delusions, and six definite hallucinations. There were seven with pronounced behavior disorders: six of these had made dangerous assaults; four had made ominous suicidal attempts or threats; and three had committed serious sexual delinquencies. Of these seven cases, only one (V. A.) did not also show a marked and sustained aberration of the emotional and ideational functions.

Inversion of the "daily rhythm" with night wandering or pronounced nocturnal restlessness was observed in four cases. Respiratory disorders, in conjunction with other symptoms, was observed in two cases; one had a notable sighing type of respiration; the other had periodical tachypnea, and periods of panting and forced deep inspirations. It is clear that no clearcut grouping of these cases is possible, for any of the frequent symptoms may appear in conjunction with other prominent features. Undoubtedly, were we unaware of their etiological unity, their diagnoses would have been disseminated among a large number of other classifications. For our own purposes we have classified them according to the predominant symptom group, as follows: Group manifesting increased or antisocial activity, 6; simulating other psychosis, 6; increased activity and simulation of other psychoses both prominent, 3. In one patient with psychotic symptoms the reaction to extreme inferiority feeling was the outstanding feature. Two cases we could not classify in this way. In one of these (I. B.) somnolence, night restlessness, and eye-blinking were the chief symptoms, and there were no disorders of mood or behavior. The disorder of the other case (J. B.) was essentially a continuation of the somnolence of the acute stage, unsuiting the patient for play, school or work, with the additional features of eye-blinking and night wakefulness.

There is already a considerable variability of opinion in regard to the psychopathology of these cases. Three points of view may be taken. In the first place, we may assume a purely mechanistic theory, and regard the pathological changes as so altering the controlling centers of human behavior, instinct, and ideation that we have after encephalitis essentially the creation of a new personality.

Secondly, we may conceive of the encephalitic symptoms in terms of the liberation of certain instinctive trends which are normally under a higher volitional control and are thus prevented from manifesting themselves in unsocial behavior. This is the view of Hohman, who states:[29] "Our conclusions are not decisive, but the rôle of constitutional factors is not great. We have thought that the reaction, instead of being due to a specific psychopathic background, might be explained in terms of more primitive instinctive reaction." But in another article[30] he says: "We believe with

diffuse organic change the personality is apt to rupture at its point of greatest vulnerability"; he does not assert, however, that this vulnerable point may not as well be in the personality of the individual as in the forms of psychic life common to the race. Auden[3] interprets encephalitic delinquencies or aggressive acts in terms of suppression of epicritic (cortical) control, and says: "The lesions in encephalitis lead to this loss of epicritic control," and the behavior changes are then explicable as regressions. Another variant of this viewpoint is offered by Miller,[42] who, in applying Pavlov's studies on conditioned reflexes to psychopathology, suggests that the mechanisms of both schizophrenia and the Parkinsonian syndrome, such as are manifested by grimaces and rigidity, are, like narcolepsy, "phylogenetically lower sisters [gray matter of midbrain] which appear when higher levels [cortex] are somehow inhibited."

The third point of view is that the encephalitis releases certain established trends of the personality, which may be a birthright of the particular individual or the result of repressions incident to his environmental relationships. In other words, this interpretation stresses the exacerbation of psychic forces already present in the individual and peculiar to him, rather than the liberation of trends peculiar to the race as a whole. In this way, encephalitis might act as a specific precipitating factor, or it might allow the emergence of traits hitherto adequately sublimated by an individual who had previously been able to attain normal stability in his adaptations. The view is well expressed by Kasanin and Peterson:[24] "The question naturally arises as to the cause of the resemblance of these cases to the supposedly functional pattern, which depends largely upon the constitution. Thus . . . . the schizoid personality would tend to react in a way which, on the surface, very closely resembles the schizophrenic process." Some evidence to support this theory has been advanced. Gordon,[25] for example, has noted that the post-encephalitic psychoses are unusually prolonged when personal and family histories present evidence of character and behavior disorder or psychotic phenomena. V. Fleck[26] also finds a relationship between "post-encephalitic psychopathies" and hereditary taint. Kirby and Davis[36] regard one of their post-encephalitic cases as true dementia præcox, remarking: "We find distinct evidence of change of character and a shifting of religious point of view prior

to encephalitis. It is our view that in this case an incipient schizophrenic reaction has been intensified coincidentally with the brain disuse to a point at which fully developed psychosis may not be recognized." In another similar case a latent tendency to schizophrenia was indicated by the personality make-up. McCowan [41] concludes in his study of eight cases: "Many cases are not true sequelæ, the encephalitis merely acting as a precipitating cause in previously unstable or manic-depressive individuals." Bond and Partridge [9] also affirm that "there are many cases in which there is some change of disposition, many in which pre-existing psychoneurotic or psychopathic tendencies are brought out by disease." Goodhart and Cottrell [22b] remark: "It is a striking fact that in many cases in which psychotics appeared as sequelæ, there was a history of psychic deviation, often transitory, for a period long preceding the acute constitutional symptoms." Four of their 12 cases had previously shown some of the traits which appeared more distinctly and ominously after encephalitis, while seven had a past history of good behavior. Francioni [20] found a neuropathic background in all his cases.

These formulations are, however, still too vague and impressionistic. We have endeavored to ascertain more precisely what is the exact relationship between the pre-psychotic personality and the later abnormalities of mood and behavior, by determining in each case whether prior to encephalitis there was any indication of the trends developed in the psychosis, whether the germinal elements of the post-encephalitic personality may be found in the personality preceding disease. Our study has completely failed to reveal any conclusive relationship between the psychotic traits and the pre-encephalitic personality. It is true that in a few cases some isolated fragments of the post-encephalitic trends may be shown to have been present before the disease. For example, two cases (J. R., M. N.) had always been headstrong and subject to fits of temper, and the psychotic picture was dominated by uncontrollable rages and virulent attacks. Another (N. R.) had been of an unusually retiring disposition with a horror of sex topics, and her hospitalization was featured by her suspiciousness and grossly erotic hallucinations. It is also true that certain cases reflect certain pre-psychotic experiences in their delusions. For example, a young

man (R. F.) had prior to his encephalitis an intense love affair, terminated as a result of his unwillingness to marry a Catholic; his ideas subsequently centered about the belief that the Masons were hostile to him; he smelt their poisonous fumes, and incoherently discussed the girl and religious topics. Another boy at the time of the onset had been very much frightened when taken to the police station for a boyish prank, and showed extreme fear relative to this experience during the first portion of his illness—a manifestation which gradually disappeared completely. Such episodes as these are, of course, at the most superficial level and of no real psychological significance. They merely serve to color the symptoms in a way familiar in all types of mental disease, and even in the sporadic cases where they appear, they are insignificant in contrast with the much more profound changes which have occurred.

On the other hand, a complete and fundamental transformation of the personality, with the emergence of traits whose rudiments we have not been able to demonstrate in the pre-encephalitic make-up, is very characteristic. An industrious, honest, stable immigrant (V. A.) becomes a social menace, steals a pistol, is arrested for robbery and for sodomy. A placid, pleasant, sociable girl (E. G.) has explosive rages, suicidal impulses, perform thefts, and her mood fluctuates with great abruptness between euphoria and grave apprehension. A happy, energetic, easily disciplined boy of 14 (G. N.) becomes so unruly, disobedient, apathetic, and cruel to younger children that he can neither be maintained in the classroom nor at home. A retiring little girl (J. Q.), always contented when occupied with her sewing or her story books, becomes unmanageable, runs wild, is completely lacking in self-control. An energetic, popular, normally mischievous girl of 12 (N. D.) completely loses all initiative and ambition and retires to the protection of the home.

We find no adequate evidence that the trends appearing in the encephalitic were identical with those which were successfully repressed in health. It is probable that a more thorough probing of the unconscious of these cases, may reveal a measurable relationship of symptoms to pre-psychotic experience and repression; but this has not yet been done. To explain a majority of the cases, and

particularly those of the Apache or unmanageable type, the most justifiable theory seems to be that there has been definite organic injury to those regions of the brain which inhibit the primitive emotions, and insure a moral and social equilibrium by the control of purely vegetative and egocentric instincts. This interpretation is quite in accord with that of Auden cited above, and to a certain extent with Hohman, although we have not found any indication that the individual's reaction is in any way related with a "point of vulnerability" in the psychic makeup. Rather, we should feel inclined to say that the localization of the disease process itself determines the point of rupture and the peculiarities of the clinical picture.

This bring us necessarily to a consideration of what particular region plays the leading rôle in determining the symptoms. Those who, like Wimmer,[30] Gertsmann and Kanders,[22a] and Bolsi,[8] look on behavior disorders as primarily a hyperkinesia, or at times a hypokinesia, due to a liberation of the primitive basal ganglia functions, have come closest to an adequate organic explanation. Marinesco,[20] however, believes the responsible lesions are chiefly those in the lower right corpus Luysi; McAlpine [40] indicts the substantia nigra; and Buzzard [12] believes there is a specific affinity of the encephalitic virus for the vascular structures of the brain. The pathological demonstrations of the predilection of the infectious agent of encephalitis for the mid-brain gives tentative support to the theory of release of primitive trends, but it is unfortunate that we have only an inadequate conception of the exact rôle of the nuclei of the corpus striatum in the emotional constitution of the individual.

Moreover, not all the symptoms of our patients can be explained by postulating a paralysis of the "epicritic faculty," or excitation and retardation of the extra-pyramidal system. The energetic boy (J. B.), for example, who after encephalitis loses all initiative and retires to a self-ostracized state of inactivity does not seem to lend itself to the same explanation as fits our cases of impulsive behavior. A general dulling of the intelligence and a diminished capacity for initiating useful activity as the result of a more widespread lesion involving the cortex will explain it better; while a comprehensible hypersensitiveness to the ridicule entailed by a tic of the eyelid and unprecedented dullness in his schoolwork undoubtedly contributes to the picture a great deal.

It may be futile pedantry to attempt to discriminate between those complete repressions which are necessarily accomplished by all socialized human beings, and those which have never been adequately attained. Yet the mechanisms of a few cases do seem to originate in a fundamental inadequacy of germplasm or infantile adjustment which has led to a particular individualistic reaction when encephalitis has intervened. There seems to be an activation of a personality peculiarly pre-disposed to the psychosis which eventuates. Particularly true is this of cases which closely resemble schizophrenia. Neel [41] calls our attention to the 26 different diagnoses, most frequently *arteriosclerosis cerebri* and *confusio mentis*, which had previously been offered in his encephalitics; and Miller [42] says "It was very difficult for me to distinguish a case of post-encephalitic infantilism with rigidity from a case of true dementia præcox in the same ward." Moreover, Kirby and Davis [36] remark, "We know of several cases of acute psychosis which were not recognized as an encephalitic disorder until the brain was studied post mortem."

The simulation of schizophrenia has been noted by many observers, who vary greatly in their interpretation of this resemblance. The great difficulty in correlating and interpreting the symptoms common to both conditions is the variability of both clinical pictures. This makes it necessary to consider the possibility that the occasional resemblance of the two diseases is a mere chance symptomatic similitude and not the result of identical causative factors. Rogers [40b] states that in 40 cases of adult males there was no marked psychotic reaction, and no deviation of ideation sufficient to class it as schizophrenic. Cloake [38] also believes that "true psychoses were accidents, and the mania, melancholia, and dementia præcox met with occasionally were not of the well recognized types"; he offers in support of this contention the statement that supposed "precocious dements" had mental clarity; but present-day conceptions of schizophrenia would not consider this factor in differential diagnosis. Bramwell [39] agrees that in adults true psychoses are rare. But v. Economo [18] says, "We come across the same psychical disorder [the autistic withdrawal of dementia præcox] as the sequel of a lesion of the central nervous system in patients who are psychically or rather intellectually intact; they appreciate the relations of their environment, are well oriented, and their

critical judgment has not suffered." Bond and Partridge [9] find that true psychoses are rare, but these "have usually taken the form of some phase of manic-depressive insanity, or a profound hebephrenic, præcox-like reaction." Auden [3] and Raphael [45] see a strong superficial resemblance between the more advanced cases of Parkinsonian disease and the characteristic posturing of the dementia præcox, and especially of catatonic, while the mental symptoms present a very remarkable contrast; for in the encephalitic the patient is usually, if not always, intellectually intact. He describes a case of encephalitis showing a transient schizophrenic state some years after a previous illness which had been characteristic of dementia præcox. Kennedy [35] calls attention to the frequency of these postural acts, the trick of following people about the ward, purposeless odd movements, as well as the respiratory disorders, but does not remark on the similarity of these to certain symptoms seen in dementia præcox. Anderson [1] calls attention to the frequency of spitting and urinating on the floor, soiling the bed, and smearing feces. Hohman [30] also refers to these phenomena as well as exhibitionism and cites the rape of a mother by a post-encephalitic mentioned by Leak as indicative of psychic regression. Goodhart and Cottrell,[23b] although they found no group of symptoms which could be classified as a psychic entity, note that a definite splitting off of a portion of the personality traits is not present in the acute stage, and remark: "In our opinion the apparent psychic retardation is not of the schizophrenic type, but rather associated with the motor mechanism." They further observe that many of these patients resemble the dementia præcox type, especially the motor disorder of the catatonic. But we do not agree with his statement that "the sudden smile of the encephalitic patient bears no relation in psychic origin to that of the præcox. In the former it is purely automatic; it is similar in origin to that of subcortical lesions." In our opinion there is often an identity in the incongruous play of the facial muscles in both conditions, and perhaps an identical neurological basis. Barker [5] calls attention to the catatonic-like, waxy flexibility found after encephalitis, and Hohman [30] remarks that although such a condition with stupor may be mistaken for schizophrenia the clearness of the catatonic stupor and the neurological findings are absent. But we should feel that the differentiation between the two conditions is often very difficult.

On the whole, we are in agreement with most authors that the resemblance to schizophrenia is often a superficial one. Although this duplication of the symptoms of schizophrenia may be observed frequently, those features which are recognized as presenting the fundamental elements of all schizophrenic personality deterioration are not so closely simulated. It is true that an occasional case of chronic encephalitis shows a very pronounced apathy and lack of interest which closely resembles the characteristic emotional vacuity of the schizophrenic. But this similarity is very superficial, for when the patient's confidence is attained, he can be shown much more easily than the schizophrenic to be highly sensitive, and his withdrawal from contact with others is a motivated defense rather than a product of preoccupation and dulling of external interests. Loss of volition and impaired initiative is a very common thing in encephalitis, and in some cases is due to a dulling of the general intellectual momentum, and in others to a withdrawal from a world which seems too critical, but not to an essential defect in the natural desires of a human being to acquit himself creditably in the eyes of his fellows. The personality does not seem to be split in the sense of Bleuler; the patient is quite in touch with reality, and retires only to a world of fancy as a result of failure in the real world; it is not his preoccupation with the inner psychic life which is primarily responsible. The energy expenditure is reduced to a great extent by inability to perform voluntary functions well, rather than to the lack of stimulus and desire to inaugurate such actions. Therefore, the relationship of encephalitic symptomatology to the most fundamental defects of the schizophrenic in most cases cannot be so clearly demonstrated as the incidental symptoms.

Nevertheless, we find a considerable number of patients in whom the diagnosis from the mental picture alone would require a very careful analysis. In most of our cases there was so definite a history or unmistakable physical signs as to immediately suggest the probability of encephalitis. And we cannot overlook the fact that without such criteria, in some of the cases a diagnosis of schizophrenia would have been considered very seriously. It is, therefore, of great importance for investigators to bear in mind the cogent probability that cases without neurological findings are occasionally diagnosed schizophrenia when a specific test, were

there one, or autopsy findings, would have demonstrated a truly encephalitic process. Indeed, we have noted an infrequent case of schizophrenia presenting a rather abrupt personality change following a mild and apparently negligibile constitutional reaction, with some novel explosiveness of temper or insomnia, but not sufficiently pronounced to form a prominent part of the picture, and a few minor neurological findings such as are not uncommon in unquestionable dementia præcox; we feel a few of these may perhaps have been due to an encephalitic virus, although without more definite signs any diagnosis except schizophrenia would be entirely unjustified.

But even in this series, the resemblance of certain symptoms to schizophrenia has been sufficiently characteristic to cause comment. One of our cases was diagnosed dementia præcox by the doctor who referred him to the hospital. Such symptoms have been prominent in nine of our 15 cases. Especially suggestive are three types. First, there are the peculiar attitudes assumed by several patients. These, especially when there is also stupor or somnolence, may be very misleading. In other cases, however, there has been no suggestion of shyness, but there was an exaggeration of the dramatic, artificial character of these postures which, in a person making good contact, is quite different from the frequent haughty aloofness, and more natural attitudes of prayer or abhorrence, found commonly in the schizophrenic. Secondly, there is the plaintive child-like quality of manner and speech, very noticeable in three of our cases. This, in a young person, with delusions, hallucinations, some confusion, a pronounced effort to avoid other patients, the face immobile and the mood seemingly apathetic, immediately suggests the schizophrenic and frequently gives the physician an erroneous presumption whose fallacy is recognized only after a careful analysis of the picture as a whole. Thirdly, there frequently occur odd tricks which immediately suggest the symbolic behavior of the schizophrenic. Grimaces and wry smiles were observed in three patients. One patient (G. N.) was continually winking, spitting, snapping his fingers, was notably apathetic, and felt compelled to avoid cracks in the sidewalk, and to avoid touching a door. Another was dominated by fear of arrest for using too much water. A third (R. F.) with delusions of persecution and hallucinations, mimicked the physician, preached on religion,

grimaced, assumed bizarre attitudes, feared death. J. M. believed people on the street ran away from him. A patient (G. J.) who heard threatening voices, gave frequent involuntary wry smiles, struck attitudes, tended to perseverate, was retarded and confused. One acute case, a girl of 17 (S. W.), if she had shown no physical signs, would undoubtedly have been diagnosed schizophrenia. She was underactive, preoccupied, confused, apathetic, had delusions and spent the day picking at her face or fiddling with her dress. Definite negativism was noted in two.

We believe that the percentage of our encephalitic cases who present features like the hebephrenic or the catatonic is large because it is this type of patient who is sent to us. Encephalitis and schizophrenia are different diseases, but it seems that some factor common to both is sometimes present and accounts for the coincidence of identical symptoms. These are most common in schizophrenia, but they are found also in general paresis and other conditions. It is not unlikely that those symptoms are due to injury to structure or function of the basal ganglia or their connections in each of these different diseases, though certainly specific pathology in schizophrenia has never been proven. This is the belief of Farran-Ridge [19] who in this way interprets the fluttering of the eyelids, picking and scratching, grimacing, and also the respiratory disorders. The inclusion of the last group in the common category is probably most open to serious question. He lays special emphasis on the fact that emaciation during the acute stage followed by obesity is a common phenomenon in both schizophrenia and encephalitis, attributes it to pituitary injury, and believes that pruriginous phenomena are due to abnormal sensations of thalamic origin.

The sensitiveness of the post-encephalitic is mentioned by Gordon [25] and Auden [8] but has not been sufficiently emphasized in the literature. Patient study of some cases proves that the abnormality of the patient's mental life and behavior is due preëminently to a consciousness of physical inferiority. The encephalitic preserves, as a rule, sufficient mental keenness to compare his capacities with his attainments prior to his illness. He appreciates that he has changed. He feels less able to cope with mental problems. He develops Parkinsonian signs, notes the trembling of his hand when he reaches for his spoon, and the dull stupidity of his features in

the mirror. He feels conspicuous and crippled, a frightful caricature of his former self. This introspective discouragement and feeling of futility is too often, especially in a child, greatly enhanced by the jeers of his playmates, who call him "funny face," mimic him and vaunt before his eyes their skill on the playground or in the shop. Nowhere is there so striking an example of inferiority neurosis of the "organic type," although in encephalitis it is not the inevitable concomitant of the normal deficiencies of childhood which Adler describes. To some extent, it is possible that explosive weeping and impulsive rage is due largely to this factor, and not entirely to the injury of the centers of inhibition. In other words, there is present an increase of stimulus to emotional display, as well as a defect of inhibition.

This is easy to demonstrate. In the first place, the patients themselves tell us about it; they feel discouraged and embittered and unable to compete, and they inform us of the fact. Secondly, the pronounced and rapid improvement in the spirits of these patients after entering the hospital is very apparent and much more constant and clear cut than in many other psychoses. They see other derelicts; they are not ridiculed; they are taught to realize that they can do certain tasks and be of real service in the ward kitchen and the occupational therapy department. Often within a week's time a patient so abject and disheartened that his attempt at suicide seems about normal in its rationality, will be smiling and happy. This happy mood and improved behavior after more than a year in a hospital school specially designed for enlightened and considerate discipline of these patients is emphasized by Bond and Partridge,[9] although they do not consider the fundamental features of the disease have been eliminated. Similar good results when encephalitic children are given proper care in a special ward is also discussed by Robeson;[46a] and Clarke[14] depicts the marked improvement of such a case under careful supervision (although his report leaves room for doubt about the diagnosis). The problem of attenuating his inferiority feelings in the outer world is, unfortunately, an extremely difficult one and necessitates permanent hospitalization for so many. However, careful study and training to make the patients capable in some useful occupation should accomplish very definite results in certain

cases. The first essential is to recognize the important contribution of this inferiority feeling to the total picture of all cases of encephalitic psychosis and its preeminent rôle in some.

Concluding Remarks.

In the preceding pages, the psychiatric manifestations of encephalitis lethargica have been discussed. Our study of the literature and of 15 cases at the Boston Psychopathic Hospital have revealed no unequivocal evidence of a fundamental relationship between the symptoms and the patient's personality prior to the encephalitis, although the clinical picture may be superficially colored by his individuality and environmental experience. The antisocial behavior and emotional instability of the encephalitic seems to be chiefly the result of a pathological defect in the ability to control impulses which are common to the race, rather than the product of the disease and a specially conditioned personality. Many symptoms found in encephalitic psychoses resemble closely those in autochthonous disorders, and especially schizophrenia; but the parallelism of the fundamental features of such diseases appears to be exceptional. Parkinsonianism and impairment of general intelligence are common, in adults as well as in children with psychotic features. The patient's consciousness of mental and physical inferiority, and his responsiveness to enlightened discipline has been too little emphasized.

These conclusions, however, must be considered tentative, until a much more thorough study of this kind has been made. The author's chief purpose has been to advance the current interest in encephalitic psychiatry as an exceptional field for the study of the mutual relations of organic and psychogenic diseases, and the relationship of the hereditary constitution and environmental experience to psychotic manifestations of the personality.

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AN ANTHROPOMETRIC STUDY OF GENERAL PARALYSIS.

Based Upon Anthropological Measurements Made Upon One Hundred Patients with General Paralysis and Upon One Hundred and Sixty-Four Other Subjects.*

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I think it might easily be shown that . . . . we now neglect unwisely the study of those differences between man and man of which, for the most part, physiology takes no cognizance, but which may yet prove of much importance in modifying the processes of disease.—Jonathan Hutchinson.

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The fundamental problem of neurosyphilis is, obviously enough, the problem of why it exists; and further, since it does exist, what are the specific factors which play a determining rôle in its occurrence? The problem presents the greater challenge, it would seem, by reason of the fact that those individuals who eventually develop parenchymatous neurosyphilis constitute only a very small proportion of all syphilitics, so that they appear to be set apart as a very special class of syphilitic subjects, whose existence demands explanation; for it will be recalled that, if the data presented in the exhaustive study of Mattauschek and Pilcz[1] may be taken as

[1] Mattauschek, E., and Pilcz, A.: Beitrag zur Lues-Paralyse-Frage. Ztschr. f. d. ges. Neurol. u. Psychiat., 1912, Orig. *8*, 133; and especially: Zweite Mitteilung über 4134 katamnestisch verfolgte Fälle von luetisher Infektion. Ztschr. f. d. ges. Neurol. u. Psychiat., 1913, Orig. *15*, 608.

These two reports deal with 4134 Austrian army officers who acquired syphilis between the years 1880 and 1900, and whose ultimate fate was reviewed as of January 1, 1912 (second article). Of these officers, 198 (or 4.8 per cent) had developed general paralysis, and 113 (or 2.7 per cent) had developed tabes, by that date.

representative, only some 5 per cent of syphilitics ultimately develop general paralysis and about 3 per cent become tabetic. And the situation is only further complicated by the fact, now quite definitely established, that in at least one-third of all syphilitics, and very possibly in a considerably higher proportion, invasion of the central nervous system, as evidenced by the presence of positive findings in the spinal fluid (though frequently unaccompanied by clinical signs or symptoms), takes place within the first year or so after the initial infection.[2] Why it is, then, that no such invasion appears to take place in the remaining 50 to 65 per cent of early syphilitics; and, even more pertinently, perhaps, how it is that the large majority of those suffering such initial invasion, who nevertheless do not eventually develop clinical neurosyphilis, are

[2] For representative studies covering this point, see for example:

Ravaut, P.: Étude cytologique du liquide céphalo-rachidien chez les syphilitiques. Ann. de dermat. et syph., 1903, 4 s., *4*, 1. (This seems to have been the original contribution to the subject.)

Fildes, Parnell and Maitland (footnote 3).

Cornaz, G.: Study of the Cerebrospinal Fluid in the Different Periods of Syphilis. J. Nerv. and Ment. Dis., 1919, *49*, 282.

McIver, J.: The Spinal Fluid in Primary and Secondary Syphilis. Jour. Am. Med. Assn., 1919, *73*, 1765.

Wile, U. J., and Hasley, C. K.: Involvement of Nervous System During Primary Stages of Syphilis. Jour. Am. Med. Assn., 1921, *76*, 8.

Wile, U. J., and Marshall, C. H.: A Study of the Spinal Fluid in One Thousand Eight Hundred and Sixty-Nine Cases of Syphilis in all Stages. Arch. Derm. and Syph., 1921, *3*, 272.

Keidel, A., and Moore, J. E.: Studies in Asymptomatic Neurosyphilis. I. A Tentative Classification of Early Asymptomatic Neurosyphilis. Arch. Neurol. and Psychiat., 1921, *6*, 286.

Moore, J. E.: The Genesis of Neurosyphilis. Arch. Derm. and Syph., 1921, *4*, 55.

Moore, J. E.: Studies in Asymptomatic Neurosyphilis. II. The Classification, Treatment, and Prognosis of Early Asymptomatic Neurosyphilis. Bull. Johns Hopkins Hosp., 1922, *33*, 231.

The differences in the incidence of spinal fluid abnormality in early syphilis reported by these and other observers arise in part from the somewhat different criteria of abnormality employed and from the fact that by some workers the spinal fluid examination was made prior to any anti-syphilitic treatment, by others only subsequent to one or two courses of arsphenamine. Thus, under the latter conditions, Moore found definite spinal fluid abnormality in 26.4 per cent of 352 patients with primary or secondary syphilis; of these 94 patients, 72 (76.6 per cent) were asymptomatic.

thus able to overcome their early neurological involvement, remains at present wholly obscure. In the words in which Fildes, Parnell and Maitland [3] have succinctly stated the latter aspect of the problem, "The proportion of early cases [evidencing infection of the central nervous system] is apparently large, and yet only a very small number of these develop dementia paralytica. The question thus arises, which of these early cases are likely to be affected in this way?" [4] To this particular query the investigations of Moore have since supplied a plausible answer in the descriptive sense, for his data make it appear probable that the early syphilitics with strongly positive spinal fluids, proving refractory, furthermore, to routine anti-syphilitic therapy, are those who ultimately develop late clinical neurosyphilis.[5] But we are left as before with the underlying question: What is it which distinguishes those who suffer a malignant invasion of the central nervous system during the early period of their syphilitic infection, and who presumably

[3] Fildes, P., Parnell, R. J. G., and Maitland, H. B.: The Occurrence of Unsuspected Involvement of the Central Nervous System in Unselected Cases of Syphilis. Brain, 1918, *41*, 255.

[4] Fildes, Parnell and Maitland: *Loc. cit.*, p. 262.

[5] Moore (footnote 2) was able to make a division of his patients with positive spinal fluids (comprising 26.4 per cent of a series of 352 cases of primary and secondary syphilis) into three groups, "the grouping being based in part upon the type of spinal fluid abnormalities, and in part on the response of the various types to treatment." His Group I included "those cases in which the spinal fluid abnormalities consist of pleocytosis, usually slight, a slight increase in globulin content, but negative Wassermann reaction and colloidal tests. In Group II are included those patients who show a more marked pleocytosis, with cells between 10 and 100, but usually less than 50; the globulin content also is greater than in Group I; the Wassermann reaction may be either positive or negative, but if positive, fixation usually occurs only with large amounts of fluid; of the two colloidal tests, either or both may be positive, the gold being of the syphilitic zone type, and the mastic curve usually to 3, or rarely paretic." In the Group III cases, "the cell count is high, ranging from 50 to 200. The globulin content is markedly increased; the Wassermann reaction is positive with small amounts of fluid (0.2 c. c. or less); and the colloidal gold and mastic curves are both paretic."

Of 72 asymptomatic cases, 18 fell into Group I, 37 into Group II, and 17 into Group III. In a comparison of 53 whites with 19 negroes, there were, proportionately, twice as many Group II cases and four times as many Group III cases among the whites as among the negroes.

As regards the effect of anti-syphilitic treatment, Moore found that routine treatment sufficed to clear up the spinal fluid abnormalities of the

are those who subsequently develop neurosyphilis of the parenchymatous type—what is it which distinguishes these individuals from that far larger number of syphilitics who either undergo no early invasion of the cerebrospinal axis, or, when such occurs, are able to deal with it successfully and with relative ease?

The present study represents an attempt to approach this problem from the standpoint of physical constitution, by means of a comparison of the anatomical characteristics, the morphology, of patients suffering from general paralysis with those of non-paretic subjects. The rationale of such an approach hinges, however, upon the validity of two hypotheses. These two hypotheses are: (1) That the *raison d'être* of neurosyphilis is to be looked for primarily in a difference in the reaction to syphilitic infection on the part of the patient, a difference in individual susceptibility, rather than in a difference in the infecting organism—a difference in the host rather than in the parasite—the old antithesis between *le terrain* and *le grain*. (2) That such a difference in the reaction and reactivity of the host may be reflected in various anatomical characteristics, in his morphology, in brief—will find expression in

Group I type "in practically all instances." In Group II "a serologic and clinical 'cure' may be obtained by slight modification in the usual routine of anti-syphilitic treatment without the addition of intraspinal therapy." In Group III, in which the spinal fluid abnormalities are much more resistant to treatment, "practically no improvement results from the routine use of arsphenamine and the mercurials," no matter how far prolonged; "intraspinal therapy as an adjunct to routine treatment offers almost the only chance of a serologic cure."

These patients had been followed for a period of time not exceeding five years. Of the 17 Group III patients, "three have developed general paralysis, one after a great deal of treatment, two after long lapses. A fourth patient has developed outspoken neurologic signs which would now easily allow a diagnosis of cerebrospinal syphilis, though no mental changes are evident. The remainder are apparently well." (Studies in Asymptomatic Neurosyphilis. II, *loc. cit.*)

Thus, those patients in whom "neurologic invasion takes place at the time of, or before the appearance of, secondary manifestations," comprising 20 to 35 per cent of all cases of early syphilis, may be sub-divided into (1) "a small proportion who spontaneously deal with the neurologic infection, (2) a fairly large proportion, perhaps about one-half, who are rapidly brought to a serologic normal by routine treatment, and (3) the remainder, whose asymptomatic neurosyphilis is eradicated only with the utmost difficulty, and who probably represent the class of future parenchymatous neurosyphilitics." (The Genesis of Neurosyphilis, *loc. cit.*)

what Draper [6] has called the " anatomical panel " of the individual—a conception somewhat analogous to but less sweeping and dogmatic than de Giovanni's rather extravagant dictum that " the cause of the special morbidity of an organism resides in its special morphology." [7]

It will perhaps be well to examine briefly these two hypotheses. Although the second of them is the more immediately germane to the present inquiry, it will be more logical to review first the available evidence bearing upon the question whether it is a difference in the host or in the spirochæte, a difference in the soil or in the seed, which is to be regarded as being of major importance in the etiology of neurosyphilis—an application to the special problem of neurosyphilis of the general problem of " diathesis " or " inborn predisposition." Out of this latter problem has arisen the conception, first promulgated by the Italian school of clinical anthropometrists, that differences in the " soil " may include and be paralleled by demonstrable differences in the morphology of the individual subject. Such a parallelism between external morphology and what appears to be a constitutional predisposition or susceptibility or disease potentiality has been more or less successfully demonstrated in the case of peptic ulcer, gall-bladder disease, and certain other disorders by Draper,[6, 8] and in the case of the " functional psychoses " by Kretschmer,[9] Raphael,[10] Wertheimer and Hesketh,[11] and many others.

[6] Draper, George: *Human Constitution: a consideration of its relation to disease.* W. B. Saunders Co., Philadelphia and London, 1924; pp. 24, 25.

[7] de Giovanni, A.: *Clinical Commentaries Deduced from the Morphology of the Human Body* (English translation, from the 2nd Italian edition, by J. J. Eyre) Rebman Co., New York, n. d.; p. 66.

[8] Draper, G., and Dunn, H. L.: Studies in Human Constitution I. Clinical anthropometry. Jour. Am. Med. Assn., 1924, *82,* 431.

Draper, G.: Studies in Human Constitution. III. Physical types in relation to toxemias of pregnancy. Am. J. Med. Sc., 1925, *170,* 803.

Draper, G.: Studies in Human Constitution. IV. Heredity and environment, disease makers, *Ibid.,* 1926, *171,* 803.

[9] Kretschmer, E.: *Physique and Character.* (English translation by W. J. H. Sprott). Harcourt, Brace & Co., Inc., New York, 1925.

[10] Raphael, Theophile, Ferguson, W. G., and Searle, Olive M.: Constitutional Factors in Schizophrenia, in Volume V, *Schizophrenia,* of the Research Publications of the Association for Research in Nervous and Mental Diseases. Paul B. Hoeber, Inc., New York, 1928.

[11] Wertheimer, F. I., and Hesketh, F. E.: *The Significance of the Physical Constitution in Mental Disease.* The Williams and Wilkins Co., Baltimore, 1926.

Since in the case of general paralysis we have the rather striking situation that this disease represents an end-result of syphilitic infection which is manifested by only about 5 per cent of all syphilitics, it becomes pertinent to ask whether inborn predisposition is a decisive factor in this highly individual form of response to the morbid agent in question—whether in short the propensity to develop general paralysis is an affair of constitution; or, more concretely, whether, pointing to such a possibility (as suggested by the studies of Draper and others), there can be shown to exist morphological peculiarities, outwardly expressive of or at any rate in some way correlated with such a constitutional deviation, which distinguish syphilitics who develop general paralysis from syphilitics who do not. To investigate this question is the object of the present study. Obviously, results of a definitely positive nature would considerably strengthen the probability that the genesis of parenchymatous neurosyphilis is to be traced to some inherent difference in the response or reaction to the original infection on the part of the host; negative results, on the other hand, would do nothing to undermine such a supposition, but, by making it apparent that in the case of general paralysis the constitutional difference, if such there be, is not of a sort which happens to find expression in the morphology of its subjects, would contribute nothing to the problem one way or the other and would leave the question where it stands.

I. SYPHILIS *A VIRUS NERVEUX*

Neurosyphilis has been most commonly attributed to the existence of a so-called neurotropic strain of spirochæte, possessing a special predilection for the tissues of the central nervous system. But it would be difficult to say whether this theory owes its wide acceptance to its own inherent probability, or to the fact that it came into being at a time when medical interest was still almost exclusively occupied with the external agents, the exogenous factors, concerned in the production of disease, so that it was but natural to look to a difference in the infecting organism rather than in the tissues of the host for an explanation of clinical differences produced by the same microbic agent. At all events, the theory of the existence of a neurotropic strain of spirochæte rests in the main upon inferences drawn from certain clinical observations—obser-

vations which, as often the case, are difficult of interpretation, of control, and of experimental verification, and which, moreover, can in this instance be matched by other observations equally capable of supporting an alternative theory. The clinical experiences in question center principally about the matter of conjugal neurosyphilis. And these experiences have been rather diverse in character.

Hannard and Gayet,[12] for example, found among 2429 paretics admitted to hospital between January 1, 1871, and July 1, 1909, only 23 (0.95 per cent) whose marital partners also had general paralysis (with or without tabes). Mönkemoeller[13] discovered among 741 paretics 18 instances (2.4 per cent) of parenchymatous neurosyphilis in the spouses; in 14, both husband and wife had general paralysis, in two cases the husband was tabetic, the wife paretic, in one case the wife was tabetic, and in one instance both husband and wife had tabes. Among 1488 general paralytics admitted to and dying in the Dalldorf Asylum during the decade 1892-1902, Junius and Arndt[14] report 38 (2.6 per cent) whose spouses had general paralysis (31) or tabes (7). Fischer[15] found 10 cases of conjugal metasyphilis among the partners of 395 married paretics (2.5 per cent), although, like the other authors here cited, he had no data on the number of these partners who were actually syphilitic and whose infection did or did not ultimately take the form of general paralysis or tabes. It is not perhaps impossible that in a large-scale retrospective survey of cases not originally studied *ad hoc*, a number of instances escaped detection or recording; it may even have happened that a remarkably small proportion of the marital partners chanced to acquire syphilitic disease of any kind from their neurosyphilitic spouses, although it should be noted that the incidence of conjugal neurosyphilis is strikingly similar in three of these four examples (totalling some 2500 cases). On the other hand, in 28 cases of general paralysis, tabes, and cerebral syphilis whose marital partners he was able to investigate, Meyer[16] found the same clinical type of neurosyphilis present in eight of the latter; and Hauptmann[17] 11 instances of asymptomatic or

[12] Hannard et Gayet: De la paralysie générale et de la tabo-paralysie conjugales dans le département du nord, 1871-1909. Ann. méd-psychol., 1911, *69*, 201 and 403.

[13] Mönkemöller: Ueber conjugale Paralyze bezw. Tabes. Monatsschr. f. Psychiat. u. Neurol., 1900, *8*, 421.

[14] Junius, P., and Arndt, M.: Ueber konjugale Paralyse und Paralyse-Tabes. Monatsschr. f. Psychiat. u. Neurol., 1908, *24*, 10.

[15] Fischer, O.: Gibt es eine Lues nervosa? Ztschr. f. d. ges. Neurol. u. Psychiat., 1913, Orig. *16*, 120.

[16] Meyer, E.: Zur Kenntnis der konjugalen und familiären syphilogenen Erkrankungen des Zentralnervensystems. Arch. f. Psychiat., 1909, *45*, 964.

[17] Hauptmann, A.: Serologische Untersuchungen von Familien syphilogener Nervenkranker. Ztschr. f. d. ges. Neurol. u. Psychiat., 1912. Orig. *8*, 36.

clinical neurosyphilis among the marital partners of 36 such cases, while eight of their partners, although syphilitic, failed to acquire any form of neurosyphilis. Raven[18] studied 117 families in which one member was syphilitic; in 90 of these, or 77 per cent, at least one other member was also syphilitic. In 65 instances in which one of the parents developed neurosyphilis in some form, it was the original victim of the infection who became neurosyphilitic in 52 (tabes in 16, tabo-paresis in 4, general paralysis in 23); in at least 15 of these the partner secondarily infected remained well (with a positive Wassermann reaction in the blood); in 13 instances the partner secondarily infected developed neurosyphilis while the partner originally infected remained well; there were 27 cases in which both partners developed neurosyphilis, either clinically or as indicated by the presence of pupillary or reflex disturbances. Thus, in at least 28 instances one of the partners, though infected, failed to develop neurosyphilis, though this was present in the other partner; and among the 27 cases in which neurosyphilis appeared in both partners, the same type of clinical neurosyphilis was seldom present: there were but two examples of conjugal tabes, one of tabes incompleta, and none of conjugal paresis; tabes and tabo-paresis, and tabes and general paralysis, were found once and three times, respectively; in 13 instances the partner secondarily infected exhibited pupillary or reflex disturbances only; in three this was true of the partner originally infected, the partner secondarily infected developing lues spinalis, tabes, and general paralysis respectively. Plaut and Göring[19] investigated 42 paretic men and 12 paretic women, finding the Wassermann reaction positive in 12 of the 42 wives of the former and in 3 of the 8 husbands (investigated) of the latter; 15 of the wives, though Wassermann-negative, had syphilitic children or a history of several abortions; thus 30 of the 50 marital partners in question were syphilitic. Of these 30 (3 husbands and 27 wives of paretics), eight were probably neurosyphilitic and one certainly so (thus 9 out of 30, or 30 per cent), the latter a case of tabes, the husband of a paretic woman—whereas no case of conjugal paresis was present. Schacherl[20] investigated the 29 husbands and 39 wives of 68 patients with neurosyphilis (general paralysis, tabes, and cerebral syphilis). There were present clinical indications of neurosyphilis in 24 of these (or 35 per cent)—*i. e.*, in 12 of the 27 partners of paretics, in 8 of the 26 partners of tabetics, and in 4 of the 15 partners of patients with cerebral syphilis; the Wassermann reaction in the blood was positive in 22, negative in 31, of the 53 marital partners of patients with general paralysis or tabes. Seelert[21] studied 39 out of 42

[18] Raven, W.: Serologische und klinische Untersuchungen bei Syphilitikerfamilien. D. Ztschr. f. Nervenheilk., 1914, *51*, 342.

[19] Plaut, F., and Göring, M. H.: Untersuchungen an Kindern und Ehegatten von Paralytikern. Münch. med. Wchnschr., 1911, *58*, 1959.

[20] Schacherl, M.: Ueber Luetikerfamilien. Jahrb. f. Psychiat., 1914, *36*, 521.

[21] Seelert, H.: Untersuchungen der Familienangehörigen von Paralytikern und Tabikern auf Syphilis und damit zusammenhängende nervöse Störungen

marital partners of 30 paretics and 10 tabetics; 22 had a negative Wassermann reaction in the blood at the time of examination; of the 16 with a positive reaction, four developed tabes (one of them the wife of a tabetic), three developed general paralysis (one the wife of a paretic), and one exhibited pupillary and reflex disturbances—a total of 8 who out of the 16 (or 17) known to have been infected by their spouses developed neurosyphilis, or 20 per cent of the total number of marital partners.

From these fairly representative contributions it might be inferred that in general the incidence of clinical neurosyphilis in the marital partners of neurosyphilitics was somewhat high, although in many of the syphilitic partners their disease apparently remained latent. More specifically, Moore and Kemp,[22] analyzing the combined figures of the last four studies cited (Raven, Plaut and Göring, Schacherl, and Seelert), find that as regards the parenchymatous form of neurosyphilis (general paralysis and tabes), 64 per cent of the total number of marital partners examined (199) were syphilitic, and that of these *syphilitic* partners 42 per cent were certainly or probably neurosyphilitic; whereas in regard to non-parenchymatous neurosyphilis ("cerebrospinal syphilis") in the individual originally infected, 89 per cent of the 27 marital partners examined were syphilitic, but of these *syphilitic* partners only 33 per cent were neurosyphilitic. This contrast has been confirmed in the material of Moore and Keidel[23] and Moore and Kemp,[22] as reported in two studies which are without much question the most careful and exhaustive yet to appear on the subject of conjugal neurosyphilis. These workers subjected the marital partners whom they examined (113 in number) to a routine spinal fluid examination; of the 32 examples of conjugal neurosyphilis found, nine (or 26 per cent) were asymptomatic and would have been overlooked had this procedure not been employed. Of the 36 marital partners of 35 paretics, 24 were syphilitic (66.6 per cent) and 14 were probably or certainly neurosyphilitic (*i. e.*, 58 per cent of the *syphilitic* partners), while the type of neurosyphilis present was certainly or probably parenchymatous in 11 of the 14; of the 25 partners of 25 tabetics, 14 were syphilitic (57 per cent) and 8 of these were probably or certainly neurosyphilitic (*i. e.*, 57 per cent of the syphilitic partners); and of the 52 partners of 51 patients with non-parenchymatous neurosyphilis, 40 were syphilitic (76 per cent), but only 10 of these, or 25 per cent, were probably or certainly neurosyphilitic. (These proportions, it will be noted, are very similar to those obtained from the combined figures of Raven *et. al.* above cited). Of the 22 neurosyphilitic partners of the patients of the parenchymatous type, 8 had a type of

unter besonderer Berücksichtigung des Infektionstermins dieser Paralytiker und Tabiker. Monatsschr. f. Psychiat. u. Neurol., 1917, *41*, 329.

[22] Moore, J. E., and Kemp, J. E.: Studies in Familial Neurosyphilis. III. Conjugal Neurosyphilis (second communication). Arch. Int. Med., 1923, *32*, 464.

[23] Moore, J. E., and Keidel, A.: Studies in Familial Neurosyphilis: Conjugal Neurosyphilis. Jour. Am. Med. Assn., 1921, *77*, 1.

neurosyphilis probably similar to that in the person originally infected, 9 a type dissimilar, and 5 were asymptomatic; all of the latter, moreover, showed spinal fluids of the Group III type (abnormalities characteristic of paretic fluids)[5] and "are probably to be regarded as candidates for future parenchymatous neurosyphilis."[24] Of the 10 neurosyphilitic partners of patients with cerebrospinal syphilis, 4 had a type of neurosyphilis probably similar to that of the partner introducing the syphilis, 2 a type dissimilar, and 4 were asymptomatic; the spinal fluids of the last named would in general be classified in Group II,[6] the authors state.[24] Not only, then, is neurosyphilis of one type or another about twice as common among the *syphilitic* partners of paretics and tabetics as among the syphilitic partners of the subjects of cerebrospinal syphilis, but there is a suggestion, in spite of the small number of data here available, that this neurosyphilis is more frequently of the parenchymatous type among the partners of paretics and tabetics than among the partners of subjects with a non-parenchymatous form of neurosyphilis. But what is the incidence of neurosyphilis, asymptomatic and clinical, among syphilitics in general, and how does the incidence of neurosyphilis among the syphilitic partners of neurosyphilitics compare with it? To answer this question Moore has available the data on some 2800 unselected syphilitic women, whence it appears that the cases of clinical neurosyphilis, of early asymptomatic neurosyphilis, and of late asymptomatic neurosyphilis (thus nosologically comparable to the conjugal cases) make up just 25 per cent of this total. And this is the same percentage as is exhibited by the syphilitic wives of men with cerebrospinal syphilis (9 neurosyphilitic out of 32 syphilitic, or 28 per cent). But the incidence of neurosyphilis of these three types is *twice* as great as this among the syphilitic wives of paretic and tabetic husbands, for here we have 19 neurosyphilitic wives out of 33 who are syphilitic, or an incidence of 57 per cent.[25] Thus, "neurosyphilis is almost twice as frequent among the partners of tabetic and paretic persons as in the spouses of those with cerebrospinal syphilis," as shown by *both* the data of Moore and Kemp and the combined data of Raven, Plaut and Göring, Schacherl and Seelert; and neurosyphilis is about twice as frequent among the syphilitic wives of tabetic and paretic persons as in unselected syphilitic women in general. On the other hand, it must be noted that Solomon, an equally competent observer, examined the majority of the Wassermann-positive spouses of the neurosyphilitics in his clinic and found definitely positive spinal fluids in less than 10 per cent of them.[26]

So far as regards conjugal neurosyphilis in relation to the question of *syphilis à virus nerveux*, it may be said that this phenomenon is on the whole sufficiently rare when considered in the narrow-

[24] Moore and Kemp: *Loc. cit.*, p. 474.

[25] Moore and Kemp: *Loc. cit.*, p. 477, Table 11.

[26] Solomon, H. C.: In "Abstract of Discussion," Jour. Am. Med. Assn., 1921, 77, 7.

est sense of conjugal paresis and conjugal tabes. But when a census is taken of the marital partners of paretics and tabetics who present evidences of asymptomatic neurosyphilis in the form of objective neurologic signs highly suggestive of present (or past) syphilis of the nervous system, and when in particular the partners are included whose spinal fluids are definitely positive (and often of the paretic (Moore's Group III, type), the incidence of neurosyphilis of one variety or another among the marital partners of patients with a parenchymatous type of nervous system involvement becomes so much greater—greater, indeed, it would seem, than the incidence of clinical and asymptomatic neurosyphilis together among syphilitics at large—as to suggest the possible neurotropism of a strain of *Spirochæta pallida,* yet leaving us with the conclusion that, at least from the standpoint of this type of clinical evidence, the question of neurotropism cannot be solved: such evidence "can only suggest the existence of a neurotropic strain of spirochæte; absolute proof rests on experiment." [27]

Some mention should be made in passing of the allied topic of juvenile paresis and juvenile tabes. There can be no question that cases of these two conditions occur in a certain proportion of instances among the offspring of parents one or both of whom suffer from or eventually develop neurosyphilis of the parenchymatous type. Solomon,[28] for example, states that he has never seen a patient with juvenile paresis whose father or mother did not present either symptomatic or serologic evidence of neurosyphilis; and Schmidt-Kraepelin cites the fact that of 90 patients with juvenile paresis reported by Frölich and by Klieneberger, 15 had a paretic parent; [29] as to juvenile tabes, Cantonnet [30] has reported that

[27] Moore and Kemp: *Loc. cit.,* p. 480.

[28] Solomon, H. C.: Personal communication.

[29] Schmidt-Kraepelin, T.: *Ueber die Juvenile Paralyse.* Monographien aus dem Gesamtgebiete der Neurologie und Psychiatrie, No. 20. Julius Springer, Berlin, 1920; p. 84.

In 12 of these 15 instances, parent and offspring were of the same sex; in 3, of opposite (*loc. cit.,* p. 84). Of Schmidt-Kraepelin's own group of 40 cases, the largest single series reported in the literature, 3 had a paretic and 2 a tabetic parent (12.5 per cent), one of these five having a paretic father and a tabetic mother; in an additional 4, one parent (in one case both parents) exhibited definite pupillary and reflex disturbances (*loc. cit.,* p. 7).

[30] Cantonnet, A.: Les manifestations oculaires du tabes juvénile. Arch. d'ophth., 1907, *27,* 708.

in 15 per cent of a group of 89 cases one parent was tabetic, and in 12 per cent paretic. Kemp and Poole [31] have recently made an intensive study of the relationship between neurosyphilis in the offspring and neurosyphilis in the parent, based upon twenty families in each of which there were one or more children with neurosyphilis of some form, together with a control series of twenty families each containing one or more children suffering from congenital syphilis without demonstrable neurosyphilis. These investigators found that of the 20 syphilitic mothers in the first group, 8 (or 40 per cent) had neurosyphilis, as against 1 out of 19 (or 5 per cent) in the second group; of the 12 syphilitic fathers of neurosyphilitic children, all 12 had neurosyphilis (100 per cent), as against 3 out of 10 fathers of children with congenital syphilis but not neurosyphilis (30 per cent). No relationship between the type of neurosyphilis in the parents and the children could be determined, but it was noted that in most of the 20 neurosyphilitic parents the disease was parenchymatous in type (five paretic fathers, four tabetic fathers, two tabetic mothers).

At first sight the foregoing might appear to be evidence in favor of a neurotropic strain of spirochæte. On the other hand it is obvious that if inborn or constitutional factors are chiefly operative in producing neurological forms of syphilis, then it might be expected that such factors would be shared with a certain frequency by both parent and offspring; in other words, the assumption of a neurotropic strain of spirochæte as being the major etiological factor in congenital neurosyphilis is superfluous. For it is noteworthy that the proportion of juvenile paretics among all the offspring of paretic parents is distinctly low (not more than 1 to 3 per cent).[32] Especially does it seem to be rare to find more than one instance of congenital neurosyphilis of the parenchymatous type in a given fraternity. If neurotropism on the part of the spirochæte were the

[31] Kemp, J. E., and Poole, A. K.: Familial Neurosyphilis. IV. Incidence of Neurosyphilis Among the Parents of Congenitally Neurosyphilitic Children. Jour. Am. Med. Assn., 1925, *84*, 1395.

[32] von Rohden, F.: Ueber die Pathologie der Paralytikerfamilie. Ztschr. f. d. ges. Neurol. u. Psychiat., 1917, *37*, 110. This writer found only two instances of certain juvenile paresis among 208 children of paretic parents investigated by him. He quotes Herrmann (Münch. med. Wchnschr., 1909, No. 20) as reporting four instances of juvenile paresis among 124 children of paretic parents in Kraepelin's clinic.

important factor in the occurrence of juvenile paresis and tabes, it might be expected, perhaps, that these two conditions would occur somewhat more frequently among the syphilitic offspring of paretics and tabetics, and it might even seem that multiple instances of juvenile paresis or juvenile tabes within the same fraternity would be of more frequent occurrence than appears to be the case. In this respect the problem is analogous, however, to that presented by conjugal neurosyphilis, where, as we have seen, it might be asked: What of the neurotropism of the spirochæte in that 40 or 50 per cent of instances where it might have been manifested but was not?

In any event juvenile paresis is a rare disease and juvenile tabes a still rarer. Of juvenile paresis not more than 300 cases have been reported in the literature since the disease was first described by Clouston in 1877;[33] at the same time, it is undoubtedly the fact that many cases have been missed, the condition being mistaken for epilepsy, mental deficiency, etc. Juvenile tabes—of which, according to Parker,[34] the first case was reported by Remak[35] in 1885[36]—is so much rarer that its very existence has been questioned;[37] Ernest Jones once expressed the belief that he had seen 10 cases of juvenile paresis to every one of juvenile tabes.[37] Moreover, only about one-third as many surviving congenital syphilitics as adult syphilitics develop general paralysis; for, as against the 4.8 per cent of the latter who do so (Mattauschek and Pilcz[1]), Pick and Bandler[38] found an incidence of only 1.3 per cent (28 cases of juvenile paresis among 2066 cases of congenital syphilis) and Schmidt-Kraepelin of 1.7 per cent among the former.[38] And we have already noted that of all the offspring of parents who become paretic, not more than two to three per cent develop juvenile paresis,[23] so that the majority of eventual paretics beget families without a single example of clinical juvenile paresis among them. Thus it would seem that as far as juvenile paresis (and tabes) is concerned the theory of neurotropism tends to prove too much. It is furthermore somewhat difficult to understand, as we have said, why the special strain of spiro-

[33] Clouston, T. S.: A Case of General Paralysis at the Age of Sixteen Years. Brit. Jour. Ment. Sci., 1877, *23*, 419.

[34] Parker, H. L.: Juvenile Tabes: Review of the Literature and Summary of Seven Cases. Arch. Neurol. and Psychiat., 1921, *5*, 121.

[35] Remak, B.: Drei Fälle von Tabes im Kindesalter. Berl. klin. Wchnschr., 1885, *22*, 105. (Cited by Parker).

[36] But in his survey of 89 cases of juvenile tabes published up to 1907 (after eliminating several as of uncertain diagnosis), Cantonnet[30] includes two published in 1863 and 1884 respectively—by Leyden in *Die graue Degeneration der hinteren Rückenmarkstränge*, Berlin, 1863, p. 270; and by Ballet in the Arch. d. Neurol., 1884, p. 195.

[37] Jones, E.: The Symptoms and Diagnosis of Juvenile Tabes. Brit. Jour. Child. Dis., 1908, *5*, 131.

[38] Schmidt-Kraepelin: *Loc. cit.*, p. 83.

chæte harbored by the parent should only with great rarity give rise to more than one instance of parenchymatous neurosyphilis among the infected children; yet such seems to be the case, although isolated examples of multiple instances within a single sibship have been reported from time to time. Hoch,[39] for example, has reported the occurrence of juvenile paresis in two sisters aged 10 and 15 at onset. James[40] has published an account of three sisters, aged 20, 15, and 8, who developed juvenile tabes—the only instance of congenital parenchymatous neurosyphilis in three members of a single sibship we have happened to encounter. Grinker[41] has cited a family in which the first son was tabetic and the second paretic,[42] the mother being tabetic; the third child, a daughter aged 22, had cerebral syphilis of the vascular type (hemiplegia). Smith[44] reports a family in which a son had juvenile paresis and a daughter juvenile tabes; the father had general paralysis and the mother exhibited Argyll-Robertson pupils. Nonne[45] cites the striking case of the two tabetic daughters of a tabetic mother, with a healthy adult son born between the two tabetic daughters. Elsewhere the same writer[46] mentions a brother and sister (aged 22 and 21) who had juvenile paresis and juvenile tabes; they were the thirteenth and fourteenth children in a fraternity of which only four other members were still living, most of the others having died in early life. According to Klauder and Solomon,[43] Amelien observed an instance in which two brothers had paresis and a sister tabes, and Rieger has reported a family in which a son and a daughter had paresis, the father being also paretic.[47] Undoubtedly further

[39] Hoch, A.: General Paralysis in Two Sisters, Commencing at the Age of Ten and Fifteen respectively.—Autopsy in one case. J. Nerv. and Ment. Dis., 1897, *24*, 67.

[40] James, G. T. B.: Three Cases of Early Infantile Tabes due to Congenital Syphilis and Hereditary Neurosis. Lancet, 1901, ii, 1788. The three sisters were the fourth, eighth and eleventh children in a fraternity of fourteen.

[41] Grinker, J.: A Case of Juvenile Tabes in a Family of Neurosyphilitics. Jour. Nerv. & Ment. Dis., 1904, *31*, 753.

[42] This patient exhibited that rarity among juvenile paretics, delusions of grandeur. According to Klauder and Solomon,[43] Mott cites one and Klieneberger five such cases.

[43] Klauder, J. V., and Solomon, H. C.: Juvenile Paresis: with a Presentation of Twenty-Three Cases. Am. Jour. Med. Sci., 1923, *166*, 545.

[44] Smith, H. J.: Presentation of a Tabetic Child and Paretic Parents and Brother. Jour. Nerv. & Ment. Dis., 1916, *44*, 66.

[45] Nonne, M.: Ein Fall von familiärer Tabes dorsalis auf syphilitischer Basis. Tabes bei der Mutter und ihren zwei hereditär-syphilitischen Töchtern. Berl. klin. Wchnschr., 1904, *41*, 845.

[46] Nonne, M.: Ueber die Bedeutung der Syphilis in der Aetiologie der Tabes. Fortschritte der Medicin, 1903, *21*, 977 and 1017.

[47] References not given; if Ameline (*vide infra*) is the author referred to, the case in question is that of a tabetic sister and one tabetic brother, not two.

sporadic instances of the multiple occurrence of juvenile paresis and juvenile tabes with a single fraternity could be collected from the literature. On the other hand, there does not seem to have been any instance of this kind in the large group of 40 juvenile paretics studied by Schmidt-Kraepelin;[39] among the 20 patients who had brothers or sisters in the series of 23 cases of juvenile paresis reported by Klauder and Solomon[42] there was an instance of juvenile paresis in two sisters. Might it not be reasonable to expect that the neurotropism of the spirochæte, if such exists, would manifest itself less exceptionally? Yet Guillain, Périsson and Thévenard,[48] calling attention recently to one instance of their own, together with three others from the literature, in which both parents and one child[49] had

[48] Guillain, G., Périsson, J., and Thévenard, A.: Syphilis nerveuse familiale (Tabes chez le père et la mère, signe d'Argyll-Robertson chez leur enfant agé de quatre ans). Bull. et Mém. de la Soc. méd. des Hôp. de Paris, 1926, *50*, 203.

[49] In the case reported by these writers, both parents had tabes, and a son, aged 4, presented Argyll-Robertson pupils and a positive Wassermann reaction in the blood. In a case reported by Apert, Lévy-Fraenkel and Ménard (Tabes et paralysie générale juvéniles par syphilis acquise. Tabes de la mère, tabes et paralysie générale du père. Bull. de la Soc. de Péd. de Paris, Nov. 19, 1907, p. 331), the father, contracting syphilis two years after the birth of his child, infected both his wife and the child, all three subsequently developing tabes or general paralysis, the child at the age of 15. In a case cited by Baudouin and Lévy-Valensi (Paralysie générale juvénile chez une malade dont le père et la mère sont morts de paralysie générale. L'Encéphale 1910, p. 490), both parents of a juvenile paretic had died of general paralysis. In the third instance, reported by Grossman (The Selective Action of Spirochaetes: Report of Four Cases of Familial Ophthalmoplegia Interna, due to Congenital Syphilis. Jour. Am. Med. Assn., 1917, *68*, 963), the father had syphilitic hemiplegia (with convulsive seizures) and Argyll-Robertson pupils, the mother had Argyll-Robertson pupils, and four syphilitic children presented irregular, unequal pupils which reacted neither to light nor to accommodation.

Nonne[50] also gives a case in which both parents of a juvenile tabetic had parenchymatous neurosyphilis, the father general paralysis and the mother tabes.

Vorbrodt[50] cites an instance in which both parents of a juvenile paretic, aged 14, had general paralysis.

Junius and Arndt[51] report a case in which the father of a juvenile paretic who died at 24 developed general paralysis, while his wife became tabetic; but in addition to this, his second wife also became tabetic. (They cite the converse situation observed by Mendel (Neurol. Centralbl., 1898, *17*, 1039) in which the successive husbands of a woman who eventually became tabetic developed general paralysis and tabes respectively).

[50] Vorbrodt: Zur Kenntnis der familiären Paralyse. Deutsche med. Wchnschr., 1912, *38*, 695.

[51] Junius and Arndt: *loc. cit.* (footnote 14), case 23, pp. 32, 34, 50.

neurosyphilis of the parenchymatous type,[53] believe it evident that certain syphilitic viruses do not induce skin or visceral lesions, but display a special affinity for the nervous system. But it might still be asked, in our opinion, why these exceptional instances do not correspond more closely with the possible infrequency of identity of the "soil," even within the family group, than they do with the existence of a neurotropic strain of spirochæte whose behavior might conceivably be somewhat more uniform than seems to be the case. Indeed, Flandin[53] has recently reported five cases of non-neurologic syphilis with identical localization in members of the family: two instances of conjugal aortic syphilis; aortic syphilis in father and son; aortic syphilis in two brothers and in the wife of one of them, infected by her husband; and a case in which heredosyphilitic hemolytic icterus occurred in the father and two daughters—a rather striking replica, it may be said, of the various familial combinations which are sporadically discoverable in the case of neurosyphilis.[54] There is here, at any rate, the suggestion that in the localization of syphilitic lesions in general (and quite apart from the dichotomy of neurosyphilis and visceral syphilis), *le terrain* may be of at least equal importance to *le grain*.

At a long remove from the matter of conjugal neurosyphilis but having a possible bearing on the question of neurotropism are those instances in which several individuals all acquiring their infection from the same source have all subsequently developed neurosyphilis. However rarely, in the nature of things, such a combination of events may come to medical attention, the actual frequency of such a situation, though it might be many times that suggested by the number of known examples, would without much doubt still be low in comparison with the frequency with which such a result failed to come about. As an isolated phenomenon it is sufficiently striking; but were it ten times as common as the reported cases might indicate, it would still be difficult not to feel that coincidence played

[52] Nonne mentions a case in which the usual sequence of events was reversed: a child acquired syphilis from a boarder at the age of 5 and then infected both parents; all three ultimately developed tabes.[46]

[53] Flandin, C.: Localisations familiales électives de la Syphilis. Bull. et Mém. de la Soc. Méd. des Hôp. de Paris, 1926, *50*, 243.

[54] The author concludes that: "L'hyphothèse de la pluralité des virus syphilitiques ne paraît donc pas satisfaisante . . . . Il nous faut, logiquement, revenir à la question du terrain, ou, plus exactement, de l'adaptation d'un germe donné au terrain qui le reçoit . . . . [Les localisations familiales électives] paraissent dues non a la variété des races de tréponèmes qui, si cette hypothèse était vraie, devraient être innombrables, mais à la fragilité acquise ou héréditaire de tel tissu ou de tel organe." (*loc. cit.*, pp. 246 and 248).

a major part in the development of neurosyphilis in all or most of several individuals acquiring their infection from a given source. But it may be fair to add that the argument is one which cuts both ways, giving a perhaps equal measure of support to the neurotropic theory and to the alternative hypothesis; for if it be true that the phenomenon in question is in fact rather exceptional, it demands no more to suppose that the several individuals involved all happen to provide a suitable "soil" than to conclude that a neurotropic strain of spirochæte is responsible for a situation which arises in the few instances but fails to arise in the many.

Without attempting to cover the literature, we may call attention to the instance cited by Morel-Lavallée,[85] referred to by Souques,[86] in which five cases of general paralysis had their origin in a single source of infection, the disease having been originally contracted by the five at widely separated intervals over a period of some years. Marie and Bernard[87] report a case in which two friends who simultaneously contracted syphilis from the same woman (in 1869) both developed tabes within a year of each other (1890 and 1891), the symptoms characterizing the onset being identical in the two cases. Nonne[88] gives two examples. In one case, of three individuals infected by a prostitute during the same evening, one developed tabes and the other two general paralysis; in the other case, one of two individuals infected from a source in common developed cerebral syphilis, and the other a syphilitic spinal paraplegia with pupillary rigidity. Almost as striking as the case of Morel-Lavallée is that reported by Erb,[89] in which five unrelated per-

[85] According to Sézary, Morel-Lavallée was the first proponent of the theory of a neurotropic strain of spirochæte (in 1889).

[86] Souques, A.: Tabes conjugal. Rév. neurol., 1900, *8*, 338.

[87] Bernard, A.: Sur deux cas de tabes de commune origine syphilitique. Bull. et Mem. de la Soc. des hôp. de Paris, 1895, *12*, 664. (Also in the Gaz. méd. de Paris, 1895, *2*, 513). The same case is reported by Marie and Bernard as Deux cas de tabes syphilitiques contractés à la même source. Rev. gén. de clin. et de theráp. (Jour. des Prat.), 1895, *11*, 270.

[88] Nonne, M.: *Syphilis und Nervensystem*, 5th ed., S. Karger, Berlin, 1924; p. 204 (Beob. 72 u. 73).

[89] Quoted by Nonne.[88] Nonne here cites further examples reported by Alt, Mayer, Levaditi and Marie, and Brosius—the last the famous case of the seven glass blowers infected by a comrade; of the five subsequently traced at the end of twelve years, two developed tabes and two general paralysis. In contrast to this Nonne cites in a footnote to page 205 the case published by Eichelberg of thirteen glass blowers simultaneously infected in the same manner; of these, two were lost sight of, one died of tuberculosis and one of pneumonia, and two died suddenly at 43 and 46 of "heart failure" ("luische Gefässerkrankung?"); of the remaining seven, five were well (one with a positive Wassermann in the blood, however), one had tabes, and one was dead of general paralysis.

sons infected by the same individual all developed general paralysis or tabes; and Moerchen[59] gives an exactly similar instance in which all five were infected in a single night. Most astonishing of all is the instance, also reported by Moerchen,[59] in which ten officers of a small garrison, having contracted syphilis from one prostitute, all developed general paralysis.

The converse situation is of course that in which two or more members of the same family, though acquiring their infection at different times and from different sources, all develop neurosyphilis. Such an occurrence does not seem to be at all frequent, for here again, obviously, the conditions are somewhat numerous which must be fulfilled if cases of this description are to come to medical attention; and the same consideration of course applies to the opposite situation wherein of two syphilitic brothers, for example, one develops neurosyphilis and the other does not.[59] At the same time it is to be noticed that just as the occurrence of multiple cases of neurosyphilis from a single source of infection could be explained away by the upholders of the hypothesis of *le terrain* versus *le grain* on the ground of coincidence, so might this same *deus ex machinâ* be invoked by the proponents of the theory of neurotropism to account for multiple familial cases of neurosyphilis from different sources of infection: that it is through coincidence in these very occasional instances that the several members of the same family all happen to have picked up a spirochæte of the neurotropic strain. So that once again a phenomenon which in this case seems rather strikingly to support the assumption that it is the "soil" which is the fundamental factor in the occurrence of neurosyphilis, can to a certain extent be explained away from the standpoint of the alternative hypothesis.

A case is reported by Strohmayer[61] of the occurrence of tabes in two sisters, aged 33 and 24, the third and sixth siblings in a family of definite pathological taint, in which, *inter alia*, the paternal grandmother, father and eldest sister of the two patients were diabetic. Burrow[62] reports the very

[59] Of this situation we have an example in our own material: one brother developed general paralysis seven years after infection; the other brother, though untreated and Wassermann-positive more than five years after the date of his primary lesion, was found to have a completely negative spinal fluid.

[61] Strohmayer, W.: Familiäre Tabes auf erblich-degenerativer Grundlage. Neurol. Centralbl., 1907, *26*, 754.

[62] Burrow, J. LeF.: Familial Tabes Dorsalis. Jour. Neurol. and Psychopath., 1920, *1*, 246.

striking observation of four cases of certain tabes and one probable case in a fraternity of six, all the patients having acquired their infection from different sources. Nonne[63] gives four examples of two brothers who acquired syphilis from different sources: in one case, one brother developed general paralysis, the other tabes; in the second, one became tabetic and the other developed Erb's syphilitic spinal paralysis; in the third, one developed tabes and the other presented the clinical picture of subacute transverse myelitis; in the fourth, twins developed general paralysis. Instances of familial neurosyphilis wherein members of two or more generations have developed general paralysis or tabes have been reported by Ameline,[64] Marc,[65] Dreyfus,[66] Junius and Arndt,[67] and Kraepelin,[68] among others. The first-named was able to collect no fewer than seven such instances in a group of 238 patients with general paralysis; in four cases the diseases developed in father and son, in one in father and daughter, in one in mother(?) and daughter, and in one in nephew and maternal uncle; there were likewise two instances of fraternal neurosyphilis—two brothers who developed general paralysis, and a brother and sister paretic and tabetic, respectively. In the remarkable case published by Marc, four generations were involved; the patient's grandfather and the latter's brother, the patient's father, paternal uncle and paternal aunt, together with the son of the last named, the patient and his sister, and the patient's son, nine individuals all told, all died after a period of progressive mental alienation in middle life accompanied by disturbances of gait, speech defect and tremor. This, if it can be accepted, must be the most remarkable case on record of familial neurosyphilis from extrafamilial sources. The same writer reports a case in which grandfather, father, paternal aunt, and the patient herself all died of general paralysis; and also a case in which brother and sister developed general paralysis. Dreyfus adds to these three further examples: of general paralysis in father and son, in two brothers, and in two paternal first cousins. Among the 1488 patients with general paralysis admitted to and dying in the Dalldorf Asylum during the decade 1892-1902, Junius and Arndt found 119 in whose ascendants mental disorder was present; in 26 of these this was general paralysis. In seven instances the father of the patient, in three the mother, in six a brother or sister, in six an uncle or aunt, and in four a cousin, was paretic.[69] Among 316 patients

[63] Nonne: *Loc. cit.* (footnote 58), pp. 205, 206 (Beob. 74-77).

[64] Ameline: De l'hérédité et en particulier de l'hérédité similaire dans la paralysie générale. Ann. méd.-psychol., 1900, *11*, 459.

[65] Marc, A.: Ueber familiäres Auftreten der progressiven Paralyse. Allgem. Ztschr. f. Psychiat., 1904, *61*, 660.

[66] Dreyfus, J. G.: Welche Rolle spielt die Endogenese in der Aetiologie der progressiven Paralyse? Allgem. Ztschr. f. Psychiat., 1906, *63*, 627.

[67] Junius, P., and Arndt, M.: Beiträge zur Statistik, Aetiologie, Symptomatologie und pathologischen Anatomie der progressiven Paralyse. Arch. f. Psychiat., 1908, *44*, 249, 493, 971.

[68] Kraepelin, E.: *Psychiatrie*, 8th ed., Leipsic, 1910; vol. II, p. 490.

[69] Junius and Arndt: *Loc. cit.*, p. 514.

with general paralysis investigated from this standpoint, Kraepelin found tabes or general paralysis in the father or mother nine times, in an uncle or aunt twice, and once in both the father and grandfather; in four cases a brother or sister was certainly or probably paretic. Moore and Keidel[70] instance three families in which all the affected members acquired syphilis from different sources and at widely separated dates. In one, two brothers had neurosyphilis. In the second, father and elder son both developed syphilitic eighth nerve deafness and the youngest son asymptomatic neurosyphilis. In the third, three brothers developed neurosyphilis—two of them taboparesis, and one tabes. In addition to these three families, containing eight affected members, Moore and Kemp[72] have since encountered two further families illustrating a similar situation. In one of them, two brothers, acquiring syphilis from different women at widely separated dates, both developed general paralysis. In the second family, the father acquired syphilis in 1900 and died in 1918 of general paralysis; his son contracted the disease in 1919, and in 1923 had typical taboparesis. These writers comment: "The fact that in five families such an occurrence has been observed is too striking for mere coincidence. In certain families the nervous system must be considered as a *locus minoris resistentiæ*. This point, frequently mentioned by older syphilologists, has apparently been lost sight of in recent years."[71] In our own material we have encountered five instances of familial neurosyphilis from extrafamilial sources. In three of these, father and son, father and daughter, and uncle and nephew, respectively, developed general paralysis, having contracted syphilis at widely different times and from different sources. In a fourth family, brother and sister both developed general paralysis.[72] In the fifth family, a brother developed general paralysis and a sister tabes; but in this case the husband of the latter had previously died of general paralysis, so that the sister represents an example either of familial neurosyphilis or of conjugal neurosyphilis or of both![73]

Before concluding the topic of syphilis *à virus nerveux* with a summary of these numerous and apparently rather conflicting ob-

[70] Moore, J. E., and Keidel, A.: Studies in Familial Neurosyphilis. II. Familial Neurosyphilis from Various Extrafamilial Sources. Jour. Am. Med. Assn., 1923, *80*, 818.

[71] Moore and Kemp: *Loc. cit.*, p. 479.

[72] The brother's wife has a positive Wassermann reaction in the blood (spinal fluid examination refused), a daughter aged 13 is negative in the blood, and a son aged 12 is Wassermann-positive in the blood but negative in the spinal fluid.

[73] Other instances where either or both interpretations are applicable are those of Marie and Beaussart, wherein twins infected by the same prostitute both developed general paralysis, and of two brothers contracting the disease from the same source one developed general paralysis and the other tabes; and the case cited by Mott, wherein two brothers infected by their wet-nurse both developed syphilitic meningomyelitis. (Quoted by Nonne.[58])

servations, it will be appropriate to give brief consideration to the not infrequent localization of the syphilitic process in the aorta in patients with general paralysis or tabes. For it has long been known that syphilitic involvement of the aorta, though by no means always sufficient to produce signs or symptoms during life, is demonstrable at necropsy in an appreciable proportion of the subjects of neurosyphilis. Yet this is only to say that did a neurotropic strain of spirochæte exist, such neurotropism by no means excludes an elective affinity on the part of the infecting organism for tissues other than those of the central nervous system. Indeed, Moore and Kemp employ a phraseology which to some extent covers this point, in that they speak of "a special strain of *Spirochæta pallida*, which invades chiefly the nervous system but is also capable of involving such other organs of the body (skin, mucous membranes or male generative apparatus) as may provide for a mode of egress, infection of others and propagation of the strain."[74]

An early instance of the recognition of this association between syphilitic disease of the aorta and parenchymatous neurosyphilis (in this case tabes) is that of Berger and Rosenbach[75] in 1879. Since that date numerous statistical studies intended to arrive at the incidence of aortic syphilis in paretics and tabetics have been published, many of them to be accepted with a certain reserve because of the fact that syphilitic lesions of the aorta are not necessarily to be distinguished with certainty from non-syphilitic, so that it is important to confine necropsy material to patients under the age of 40 or 45 at death. In their comprehensive study, Junius and Arndt,[76] for example, found 693 cases (out of 911 coming to necropsy; 75.5 per cent) that exhibited sclerotic changes in the aorta; though they do not give the total number of necropsied patients dying under the age of 40, 292 of these 693 cases, or 42 per cent, were below the age of 40 at the time of death; so that syphilis was probably responsible for the degenerative changes in the aorta present in at least half of the total number of patients with general paralysis who exhibited these changes. Other studies of this kind, as shown in the survey of the literature of the topic given by Friedman,[77] have yielded rather discrepant

[74] Moore and Kemp: *Loc. cit.* (footnote 22), p. 478.

[75] Berger and Rosenbach: Berl. klin. Wchnschr., 1879, *27*, 402. (Cited by Friedman, *loc. cit.*) According to Friedman, these writers called attention to the coincidence of tabes and aortic regurgitation, which Charcot had also noted, in seven cases, but did not emphasize the relationship between the two conditions.

[76] Junius and Arndt: *Loc. cit.* (footnote 67), p. 540.

[77] Friedman, E. D.: On the Associated Incidence of Syphilis of the Central Nervous System and Cardiovascular Syphilis. Arch. Neurol. and Psychiat., 1919, *1*, 289.

data upon the frequency of the association of syphilitic aortic disease and neurosyphilis.[78] Passing over these, we will here cite in some detail only the recent excellent study of Musser and Bennett,[79] who approached the problem from the opposite direction by examining the spinal fluid in thirty clinically unquestionable cases of syphilitic aortitis (aneurysm or aortic insufficiency plus syphilis), discovering thus six definitely positive spinal fluids among these thirty patients.[80] These workers furthermore collected from 6363

[78] We cite the following examples from Friedman:

Ruge and Hüttner: Berl. klin. Wchnschr., 1897, *34*, 760: 9 cases of aortic regurgitation among 138 tabetics.

Nordman: *Le cœur de tabétiques,* Thèse de Paris, 1895: 8 cases of aortitis among 100 tabetics; 65 cardiacs with aortic disease among tabetics reported in the literature.

Schuster: Deutsch. med. Wchnschr., 1903, *29*, 737: 3 cases of aortitis among 22 tabetics.

Hertz: *Les nerfs du cœur chez les tabétiques,* Thèse de Paris, 1903: In 98 tabetics, 6 cases of aortic regurgitation, 2 of aneurysm, and 16 of dilated aortic arch; among 76 tabetics with cardiac disease there were 48 cases of aortic regurgitation.

Guilly: *Fréquence de la coexistence chez les syphilitiques des aortites avec le tabes et la paralysie générale,* Thèse de Paris, 1904-05, No. 57: 10 cases of aortic disease among 33 living paretics; of 200 cases of general paralysis coming to necropsy, 41 showed evidence of aortic disease, aortitis, changes at the valve, atheroma.

Braun: Mitt. d. Gesellsch. f. inn. Med. u. Kinderheilk., 1910, 9, Suppl. 1: 23 certain and 5 probable cases of aortitis among 103 cases of general paralysis.

Cited by Musser and Bennett:

Balacakis: *Des lésions aortiques chez les ataxiques,* Thèse de Paris, 1883: 3 cases of aortitis in 55 tabetic patients.

Lesser: Berl. klin. Wchnschr., 1905, *42*, 991: 18 cases of aortic aneurysm among 96 cases of tabes which came to necropsy.

Straub, quoted from Ophuls, Am. J. Med. Sc., 1906, *131*, 978: Aortitis in 82 per cent of 84 general paralytic patients.

And Friedman (*loc. cit.*) found among 125 cases of neurosyphilis (mostly tabes) 19 patients with cardiovascular disease, of whom "13 showed disease of the aortic valve either alone or in combination with aneurysm or dilatation of the aortic arch."

[79] Musser, J. H., Jr., and Bennett, A. E.: The Incidence of Syphilis of the Aorta with Interstitial and Parenchymatous Neurosyphilis. Arch. Int. Med., 1924, *34*, 833.

[80] In five of the six the Wassermann reaction was positive—in four in all antigens, in one in cholesterin alone. In three of the six the gold curve was of the paretic type. Four of the six presented clinical evidence of neurosyphilis, and two did not; of the four, two were diagnosed general paralysis: one cerebrospinal syphilis and one cerebral thrombosis; none showed signs of tabes.

necropsy records of the Philadelphia Hospital (1906 to 1923) 110 cases of general paralysis, 102 cases of cerebrospinal syphilis and 50 cases of tabes in which descriptions of the aorta were given and in which advanced or late syphilitic aortitis could definitely be said to have been present. In the group of cases of interstitial neurosyphilis there were thirty-eight (37 per cent) showing late syphilitic lesions of the aorta; in nine of these, large saccular aneurysms were present. In the group diagnosed as general paralysis the incidence of syphilitic aortic disease was 27 per cent; four of the patients had aneurysms. Of the fifty tabetic patients (including three classified as taboparesis), thirteen, or 26 per cent, had old specific aortic lesions; there were no cases of aneurysm in this group. The writers consider it of interest that none of the fifty cases of clinical aortitis (aortic insufficiency and aneurysm) had signs of tabes,[80] nor did any of the fifty cases of tabes have an aneurysm. They are inclined to conclude from these data "that syphilitic aortitis and aneurysms are more frequently associated with neurosyphilis of the endarteritic and meningeal types"; [81] especially was this true of aneurysm, since there were more than twice as many aneurysms in the 102 interstitial cases (*i. e.*, nine) as in the combined parenchymatous group of 160 cases (*i. e.*, four). This seems to them to point to "a selective affinity for the cardiovascular system by one strain of spirochæte and a highly neurotoxic virus in another strain." [81]

A rather catholic conception of the organotropism of the spirochæte is perhaps enforced by the observations of Warthin,[82] who, it will be recalled, demonstrated that in all cases of old syphilis—whether cases of active late syphilis or of latent syphilis, treated or untreated, cured or uncured, Wassermann-positive or Wassermann-negative—there were present in many of the organs of the body—most easily recognized in the aorta, heart, testes, adrenals, pancreas, central nervous system, liver and spleen—the specific lesions of spirochæte localization, an irritative or inflammatory process characterized by lymphocytic and plasma-cell infiltrations in the stroma particularly about the blood vessels and lymphatics, slight tissue proliferations, eventually fibrosis, and atrophy or degeneration of the parenchyma. On the other hand, the great majority of the focal fibroses in the leptomeninges encountered in Warthin's material were healed inactive areas, appearing in the latent cases to represent, he believed, old and early lesions in the history of the individual infection—as might be expected from what we know of the invasion of the cerebrospinal axis in early syphilis; but "the occurrence of active lymphocyte and plasma-cell infiltrations in the meninges in old latent cases of syphilis seemed, however, to parallel the degree of activity of the lesions found in the heart, aorta and other tissues." [83] Precisely the same

[81] Musser and Bennett: *Loc. cit.*, p. 839.

[82] Warthin, A. S.: The New Pathology of Syphilis. Am. Jour. Syph., 1918, *2*, 425. (See also: The Persistence of Active Lesions and Spirochætes in the Tissues of Clinically Inactive or "Cured" Syphilis. Am. Jour. Med. Sc., 1916, *152*, 508).

[83] *Loc. cit.*, p. 431.

lesions in the meninges, and sometimes focal infiltrations of lymphocytes and plasma cells in both brain and cord, occurred in the nonparetic and nontabetic cases of syphilis as in those having clinical paresis or tabes, the only difference being one of degree. "Such infiltrations represent simply the local reaction to the presence of spirochætes; and their relation to paresis and tabes may be simply one of degree, with reference to the number of infecting organisms, the degree of intoxication produced, and the resulting destruction of nerve tissue and functional disturbance produced."[84] In any event, syphilitic inflammations of the type described are usually widely distributed throughout the entire body, although in individual cases a special predilection for certain organs or tissues is shown. "No explanation of these system, organ or tissue predilections is yet evident; neither is there any explanation of those cases in which all organs and tissues show the most severe degree of these lesions."[85]

We shall presently refer to the work of Brown and Pearce, which has since thrown further light upon the question of "these system, organ or tissue predilections," and which has carried several steps forward the suggestion implicit in the observations made from the standpoint of pathology that the theory of a neurotropic strain of spirochæte is a somewhat too limited conception wherewith to account for the multiple and various phenomena involved.

If we attempt to summarize the foregoing observations, we find that they fall into such categories as the following:

(1) *Conjugal neurosyphilis,* which in the narrow sense of conjugal paresis and conjugal tabes appears to be a good deal of a rarity. At any rate, tabes or general paralysis does not seem to develop in the marital partners of more than 3 per cent, perhaps, of all paretics and tabetics; and if it were assumed, as a preposterously low estimate, that only one-tenth of these partners had previously acquired syphilis from their mates, even then only some 30 per cent of the *syphilitic* spouses would develop the same clinical type of syphilis as their mates, while about two-thirds of them would fail to do so. Yet when neurosyphilis is considered from the broader standpoint of the presence of positive findings in the spinal fluid, as Moore has done, the incidence of neurosyphilis in this sense among the *syphilitic* marital partners of neurosyphilitics is found to be far higher than this. Are we to explain this discrepancy by the supposition that many of these patients with "laboratory" neurosyphilis are not candidates for subsequent clinical neurosyphilis and will never develop a parenchymatous form of the

[84] *Loc. cit.*, p. 432.
[85] *Loc. cit.*, p. 451.

latter? For of Moore's 22 neurosyphilitic spouses of patients with parenchymatous neurosyphilis, only eight, it will be recalled, had *clinical* neurosyphilis of a type probably similar to that in the marital partner originally infected, although all five of the asymptomatic spouses exhibited spinal fluid abnormalities of the "Group III" order. But what is much more to the point in the present connection is the control to which these observations were subjected. For even leaving aside the comparison with a group of 2800 unselected female syphilitics in all stages of their infection on the ground that their heterogeneous character introduces such complicating factors as previous treatment, pregnancy, etc., the fact remains (and it is the more striking, from a comparative standpoint, of the two control observations in question) that the incidence of neurosyphilis in the broad sense (clinical and asymptomatic) is less than half as great among the syphilitic spouses of the subjects of interstitial neurosyphilis as it is among the syphilitic spouses of the subjects of parenchymatous neurosyphilis; that is, 25 per cent *versus* 57 per cent, while it might be added that 25 per cent was also the incidence of neurosyphilis of all types among the 2800 unselected female syphilitics. That this sharp and apparently unquestionable distinction between the marital partners of the subjects of interstitial neurosyphilis, on the one hand, and those of the subjects of parenchymatous neurosyphilis on the other, which Moore has observed in his material—that this distinction can also and to the same degree be drawn from an analysis of the combined data of Raven, Plaut and Göring, Schacherl, and Seelert, is certainly suggestive, and makes this the most cogent piece of clinical evidence available in support of the theory of a neurotropic strain of *Spirochæta pallida*. As the *only* such evidence of a clinical nature, it appears worthy of amplification and fuller confirmation.[*]

[*] On the other hand, it is pointed out by Moore and Kemp (*loc. cit.* (footnote 22), p. 469) that if the fact of early nervous system invasion be considered as evidence of neurotropism of the spirochæte, then neurosyphilis ought to be frequent among the infected marital partners of those early syphilitics in whom such invasion had taken place, since in cases so recent it is certain that the strain of organism infecting husband and wife is the same. But neurosyphilis in the marital partners of this group was uncommon. Of 14 partners of early syphilitics with positive spinal fluids (average duration of infection six months), 11 had syphilis, but of these only three were neurosyphilitic.

(2) *Multiple cases of general paralysis and tabes developing from syphilitic infection from a single source.* Observations of this type are sufficiently dramatic, especially when the number of individuals involved runs to five and even ten; and they seem to furnish extremely plausible evidence for the existence of a neurotropic strain of organism, as indeed one example seems to have been responsible for the initial propounding of the theory. There is no information, however, so far as we are aware, regarding the ultimate fate of the individuals originally responsible for these multiple cases of neurosyphilis—whether there is further evidence in their own persons that they harbored a neurotropic type of spirochæte. Above all, there must be countless examples (which naturally do not come under observation) of multiple infections from a single source which show no such uniformity in their clinical outcome. If the latter supposition is correct, it would be legitimate to infer that this type of phenomenon might on these unusual occasions be ascribable to the chance co-infection of individuals possessing the same disposition toward the development of neurosyphilis.

(3) *Juvenile paresis and tabes.* The great frequency with which at least one parent of the juvenile paretic or tabetic is himself a subject of general paralysis or tabes or asymptomatic neurosyphilis again lends considerable plausibility to the supposition that this combination of circumstances is due to the presence of a strain of spirochæte with a special predilection for the tissues of the central nervous system. On the other hand, juvenile paresis and tabes are in any case conditions of rather rare occurrence; yet if juvenile paresis, for example, constitutes about 1.5 per cent of all the cases of congenital syphilis, what proportion does it make up of the congenitally syphilitic offspring of neurosyphilitic parents? This we do not know; but we do know that juvenile paretics make up probably not more than 3 per cent of the total offspring of paretic parents, and that the occurrence of two cases of juvenile paresis or tabes within the same fraternity is distinctly unusual. Once again it is the numerous exceptions which are difficult to account for; it is difficult to see why, if a neurotropic strain of spirochæte is responsible for general paralysis in parent and offspring, the offspring should not be somewhat more uniformly, instead of only exception-

ally, affected in this way.[87] Such a consideration would be less damaging to the theory that it is the " soil " rather than the " seed " which is of major importance; for it is at least conceivable that cases of congenital neurosyphilis of the parenchymatous type arise on those occasions, perhaps the exception rather than the rule, when the suitability of the " soil " is shared by parent and offspring.

(4) *Familial neurosyphilis from extra-familial sources.* This is the type of observation which outwardly seems to lend the most direct support to the conception of *le terrain* versus *le grain,* and is most difficult to reconcile with the theory of neurotropism; for it would be only chance that governed the infection with a neurotropic strain of organism of several individuals who contracted the disease from widely different sources, whereas the blood relationship of these several individuals does suggest the possibility of similarity in the " soil " as accounting for the development of the same clinical type of syphilis in all of them. And since this similarity in the " soil " is not necessarily shared in all or any respects by all the members of a given family group, it is easier to account for the exceptions that occur in this instance (as in the case of two syphilitic brothers, for example, of whom one develops neurosyphilis and the other does not) than it is to explain from the standpoint of the theory of neurotropism the exceptions noted above, wherein infection from a single source which gives rise to neurosyphilis in three or four or more individuals fails in others to produce this ultimate result. At the same time, that an apparently considerably greater number of rather striking examples of familial neurosyphilis from extra-familial sources is on record than is true of multiple cases of neurosyphilis from a single source of infection, is not surprising and perhaps not deserving of too much emphasis, since instances of familial neurosyphilis are in the nature of the case much more accessible to medical observation. Nevertheless, the fact that such instances do occur with a certain frequency is certainly arresting, and, as Moore has remarked,[71] too striking for mere coincidence. It is further suggestive from this standpoint that examples are not unknown of the localization of the syphilitic disease process in identical regions other than the central nervous system in two or more members of the same family.

[87] We note that Hübner asks why it should be that not infrequently a single sibling is neurosyphilitic while the other members of the fraternity escape. (Nonne: *Loc. cit.* (footnote 58), p. 208).

An attempt, then, to evaluate these clinical observations, to estimate their cogency to the validity of the theory of neurotropism and the alternative theory of the "soil" versus the "seed," would lead, as we think, to the conclusion that the observations under (4) appear to lend a somewhat greater measure of support to the latter hypothesis than do any other observations to the neurotropic theory, with the possible exception of the findings of Moore in the matter of conjugal neurosyphilis discussed above. Briefly, then, (1) conjugal neurosyphilis in the narrowest sense (conjugal paresis and conjugal tabes) can be explained by the one hypothesis about as well as by the other; or rather, neither hypothesis is here especially in point, because the proportion of syphilitic mates of paretics and tabetics who develop general paralysis or tabes does not appear to exceed the proportion of syphilitics in general who do so. At the same time, there is seeming evidence that the incidence of neurosyphilis of all types is materially higher among the syphilitic mates of paretics and tabetics than it is among the syphilitic mates of the subjects of "cerebrospinal" syphilis; this evidence appears to favor the theory of neurotropism, and it is the only clinical evidence which does so. (2) Multiple cases of parenchymatous neurosyphilis developing from a single source of infection do nothing toward supporting the neurotropic theory, since chance is here in all probability the sole factor responsible for the certainly very occasional occurrence of that which, on that theory, should be almost the rule rather than the rare exception. (3) Juvenile paresis and tabes are conditions which throw no light on the matter; their rarity among the total offspring of parents who subsequently develop general paralysis (since their incidence among these is not materially, if indeed at all, greater than the incidence of juvenile paresis among *all* congenitally syphilitic children), together with the conspicuous infrequency of multiple instances of the disease within a single fraternity, is, if anything, more difficult to reconcile with the neurotropic theory than with its alternative. (4) Familial cases of parenchymatous neurosyphilis from extra-familial sources we have already discussed as appearing to lend a certain measure of support to the hypothesis of the "soil." Here again, however, it is the positive instances which attract attention, while the negative instances remain unknown and unnumbered; and the probability that syphilitic siblings or other relatives must frequently fail

to develop the same type of syphilitic localization should at least induce wariness in drawing conclusions from a phenomenon whose frequency, relative to the total possibilities of its occurrence, is none too certain.

In brief, clinical observations, as Moore has remarked,[87] can be regarded as only suggestive; conclusive proof of the existence or non-existence of a neurotropic strain of spirochæte rests on experiment. So far as they go, clinical observations seem to indicate that a neurotropic strain of organism can hardly be the only factor in the occurrence of neurosyphilis, nor is it even necessarily the most important one.[88]

A word in conclusion on the experimental work that has been done in this field. We need only mention in passing the well known experiments of Levaditi and Marie,[89] who observed a much longer incubation period characterizing the syphilis in the rabbit produced by spirochætes from paretic brains than in that produced by organisms from primary lesions; for it is equally well known that these results have been discredited by Jahnel[90] and by Brown,[91] on the

[88] Sézary, in a recent discussion of the theory of neurotropism (Sézary, A.: La syphilis nerveuse conjugale et sa pathogénie. Presse méd. 1925, *33* 1505), emphasizes the occurrence of aortitis in neurosyphilitics and the fact that of two conjugal neurosyphilitics one may develop aortitis in addition or the marital partner of a neurosyphilitic may develop syphilitic aortitis without any sign of neurological involvement. Calling attention to the infrequency with which it happens that both parents of a neurosyphilitic child are neurosyphilitic, he states that the children of such parents may have cutaneous or bone syphilis, as in the case published by himself and Margeridon (Bull. de la Soc. méd. des Hôp. de Paris, 1925, No. 13, p. 562) of the 20-year-old daughter of a paretic father and a tabetic mother who in childhood had an interstitial keratitis and a perforating gumma of the palate, without any sign of neurosyphilis; in such a case, the writer says, it is impossible to suppose that the child was infected from childhood with a virus different from that of her parents.

The arguments against the theory of a neurotropic strain of spirochæte are more fully discussed by the same writer in: Pathogénie de la paralysie générale et du tabes. Rév. neurol., 1921, *37*, 337; and La pathogénie des affections nerveuses parasyphilitiques et la doctrine du virus neurotrope. *Ibid.*, 1923, *39*, pt. II, 414.

[89] Levaditi, C., and Marie, A.: Études sur le tréponème de la paralysie générale. Ann. de l'Inst. Pasteur, 1919, *33*, 741.

[90] Jahnel, F.: Das Problem der progressiven Paralyse. Ztschr. f. d. ges. Neurol. u. Psychiat., 1922, *76*, 166.

[91] Brown, W. H.: In "Abstract of Discussion," Jour. Am. Med. Assn., 1921, *77*, 7. "The strongest evidence for strains is clinical evidence. Some

ground that confusion with the common *Spirochæta cuniculi* of rabbits [92] was not satisfactorily eliminated or disproved in this experimental work, and in particular that organisms derived under wholly different cultural conditions cannot legitimately be compared as regards incubation period and other biological properties. Nichols [93] concluded from his studies that there exists a distinct strain of *Spirochæta pallida* characterized chiefly by its invasive power; he believed that the invasive power of the parasite may be of more importance in syphilis of the nervous system than its affinity for this organ or for that. The experimental observations of Reasoner [94] led him to the opinion that nervous involvement in the human being is a matter of predilection for certain tissues on the part of the spirochæte, combined perhaps with a higher degree of invasiveness; he observed choroiditis and chorioretinitis in rabbits inoculated with two different strains "known to have produced nervous syphilis in the human being" (as did also Nichols) and with one strain of unknown characteristics, but did not observe these lesions in rabbits inoculated with fourteen other strains obtained from chancres and mucous lesions.

Brown and Pearce [95] point out that variation in the clinical course of syphilis is characteristic of the rabbit, as it is of the human

laboratory work tends to confirm a dualistic strain theory. The clinical evidence is just as strong for one as for the other of these theories. . . . . The great difficulty which has arisen from laboratory studies is due to the fact that these comparisons have been made for the most part under wholly incomparable conditions—freshly isolated strains compared with strains carried for a number of years. The only proper way is to study strains isolated at practically the same time from the same source and carried under the same conditions and then vary the conditions. We need facts, a great many more facts than we possess, before we are ready to commit ourselves to any opinion as to what the causative organism is in this disease as to strain."

[92] Noguchi, H.: Venereal Spirochætosis in American Rabbits. J. Exp. Med., 1922, *35*, 391.

[93] Nichols, H. J.: Observations on a Strain of Spirochæta pallida Isolated from the Nervous System. J. Exp. Med., 1914, *19*, 362.

[94] Reasoner, M. A.: Some Phases of Experimental Syphilis: with special reference to the question of strains. Jour. Am. Med. Assn., 1916, *67*, 1799.

[95] Brown, W. H., and Pearce, L.: Experimental Production of Clinical Types of Syphilis in the Rabbit. Arch. Derm. & Syph., 1921, *3*, 254. See also: The Resistance (or Immunity) Developed by the Reaction to Syphilitic Infection. *Ibid.*, 1920, *2*, 675.

infection; that with the use of a given strain of *Spirochæta pallida* one may still obtain infections exhibiting decided clinical variations, not only in the type of lesions in a given group of tissues but equally so in the groups of tissues involved. This was especially noticeable in the frequency with which keratitis and iritis occurred following the use of one set of experimental conditions and the frequency with which lesions of the periosteum and bone followed another. "Th.. ..ct that it is thus possible to produce a scale of variations in the clinical course of syphilitic infection by modifying the reaction of the experimental animal indicates the importance of this group of factors in determining the character of the disease."

This modification in the reaction of the experimental animal was brought about by subjecting rabbits which had been inoculated either in one testicle or in both to early castration (to abort the testicular reaction early in the course of the infection and thus shift the defensive reaction to other tissues before any considerable degree of protection had been developed), to late castration (to permit the infection to progress to a point at which the protection developing from the primary foci was nearly but not quite sufficient to prevent the occurrence of lesions in other parts of the body), or to a single intravenous injection of arsenical (to exercise a temporary restraint on the primary lesions and in addition perhaps to nullify any protection that has been developed and render subsequent reactions on the part of the animal less effectual); for the occurrence or non-occurrence of generalized lesions in the rabbit, as well as the character of these lesions, appears to depend primarily on a protective reaction which takes place at the primary foci of infection, but also to some extent on the relative susceptibility of other tissues. Thus these workers showed that by early castration it is possible so to alter the course of the disease as to cause bone lesions practically to supplant those of the testicle in the defensive reaction, while by permitting the testicular reaction to progress to a given point (as by late castration) it is possible to confer protection on this group of structures; but in this case "the generalized disease begins with the next group of tissues in order, producing an infection which is essentially one of the skin, mucous membranes and eyes." What is of particular interest in the present connection is the observation that while in the majority of animals inoculated in both testicles a high degree of protection seemed to be conferred on other tissues of the body, in many instances the protection failed to reach the eyes, and lesions of the cornea and iris appeared as the only clinical manifestations of a generalized disease. Now in the rabbit eye lesions are not only terminal and frequently the only generalized conditions that occur, but they are also relatively slight and more prone to repeated relapse than any other class of lesions. Thus it is suggested that all tissues are not equally protected by the general reaction which occurs during the early stages of a syphilitic infection, and that certain tissues which fail to receive this protection, although

less susceptible to injury or infection than other tissues, may be capable of only a relatively slight degree of self protection. "This is undoubtedly the case in the experimental animal, and if similar conditions obtain in man, such conditions as neurosyphilis may be explainable on this basis."

In sum, then, wide variations in the clinical type of the disease may be traceable to this one group of causes; and while this does not eliminate the possibility that variation in the biological properties of the infecting organism may contribute to further variations in the type of the disease, it is nevertheless certain that the type of infection produced in the rabbit (and possibly also in the human being?) by the inoculation of a given strain of *Spirochæta pallida* may be regarded as a resultant of the somatic factors which Brown and Pearce have demonstrated, and subject through this cause alone to a wide degree of variation.[96] The possible applicability of these considerations to the genesis of neurosyphilis in man—as indeed Brown and Pearce have noted—needs no further comment.[97]

[96] According to Chesney (Chesney, Alan M.: *Immunity in Syphilis.* Medicine Monographs Vol. XII. The Williams and Wilkins Company, Baltimore, 1927; especially, pp. 66-68), Kraus and Volk proposed the view in 1906 that the resistant state that develops during the course of syphilis might be conferred upon certain tissue groups and not upon others; in other words, that it was regional in distribution and perhaps not general. And the reinoculation experiments of Tomasczewski with rabbits may be regarded as offering support for this conception of regional immunity in syphilis, states Chesney. The work of Brown and Pearce [95] carries with it a similar implication; their conception that the character of the initial response of the animal to syphilitic infection will determine the subsequent course of the disease so far as the evolution of generalized macroscopic lesions is concerned, and that reactions taking place in one group of tissues may give rise to protective influences which are imparted (in a certain definite sequence) to other groups of tissues, "implies that the resistant state which develops during the course of syphilis is at least unequally shared by certain tissues, and it seems not unlikely that this inequality of participation in the immune reaction may explain the subsequent course of the disease in any given individual."

[97] It is, of course, well known that a very considerable proportion of those who ultimately develop general paralysis give what is often a reliable history of a primary lesion which was small or atypical or escaped the observation of the patient altogether, or in particular of secondary manifestations which were slight, fleeting or absent. Fournier,[98] for example, was able to follow 83 cases in person from the chancre to the development of general paralysis; 70 of these had had only a fleeting roseola or mucous patches or alopecia, 2 had shown nothing except the chancre, 8 had had moderate secondary lesions, and 3 tertiary lesions. Conversely, of 243 cases of severe secondary syphilis,

Does the present state of our knowledge, then, justify any bias in favor of the theory of a neurotropic strain of spirochæte, or in favor of the alternative hypothesis that the reaction or reactivity of the host is of greater etiological significance in the occurrence of neurosyphilis? At once we are compelled to discard the majority of the data here surveyed, because their bearing on the question, if indeed they have any bearing, is wholly indeterminate and indeterminable. We are left in the end with just two pieces of evidence to which such a statement may not altogether apply. These are:

1. The finding of Moore (and apparently also of four of his predecessors) that the incidence of neurosyphilis of all types (interstitial, parenchymatous, "laboratory") is very definitely greater

not one developed general paralysis or tabes after the lapse of many years. Similarly, White[99] found that of 1016 syphilitics who had consulted the Skin Department of the Massachusetts General Hospital on account of cutaneous manifestations early and late, only 8 subsequently developed tabes and only one became paretic. Moore[3] found that among 72 cases of early asymptomatic neurosyphilis, mild early manifestations were three times as frequent as they were among 174 unselected cases of early syphilis; that is, for every case of early neurosyphilis with cutaneous symptoms of about ordinary severity, there were three cases in which the cutaneous manifestations had been of a distinctly mild or fleeting character. On the other hand, however, about one in seven of these neurosyphilitic patients had had extensive secondary outbreaks. Whence Moore concludes that although failure to react vigorously, by means of a well marked efflorescence, to a recent infection seems to predispose to neurosyphilis, the converse proposition does not necessarily hold true: a violent secondary outbreak does not necessarily protect the patient against (early asymptomatic) neurosyphilis. (It might be asked whether any of these "one in seven" exhibited spinal fluid reactions of the "Group III" type, and as such were presumable candidates for subsequent parenchymatous neurosyphilis.)

It is also to be noted, on the other hand, that late clinical neurosyphilis does not stand alone in this respect, but that the same situation obtains in the case of the tertiary manifestations of syphilis, according to Fournier,[100] who found that of 2188 cases of all types of tertiarism, 91 per cent were preceded by mild or very mild secondary symptoms or none at all, 7 per cent by a moderate reaction, and 2 per cent by a severe secondary outbreak.

[99] Fournier, A.: *Paralysie générale et syphilis.* Masson et Cie., Paris, 1905. (Quoted by Moore[3]).

[99] White, C. J.: A Statistical Study of Syphilis: the relation of its symptoms to subsequent tabes dorsalis or general paralysis. Jour. Am. Med. Assn., 1914, *63*, 459.

[100] Fournier: Traité de la syphilis. J. Rueff, Paris, 1906, vol. II, part 1, p. 7. (Quoted by Moore[3]).

among the syphilitic marital partners of paretics and tabetics than it is among the syphilitic marital partners of the subjects of *non*-parenchymatous neurosyphilis—and at the same time, it would appear, equally definitely greater than it is among unselected female syphilitics in all stages of the disease.

2. The brilliant experimental work of Brown and Pearce indicating that in rabbits, given the employment of the same strain of infecting organism, the subsequent course of the disease in the given individual depends upon the inequality of participation in the immune reaction on the part of certain tissues—the regional and unequal distribution of the resistant state that develops during the course of syphilis, in other words; so that the eventual involvement of the cornea and iris in the rabbit (and of the central nervous system in man?) seems to indicate that in this case protection, though conferred on other tissues of the body, failed to reach these structures, lesions involving them thus appearing as the only clinical manifestations of a generalized disease.

Of the first of these, as the only piece of evidence in existence which actually suggests that a neurotropic strain of spirochæate may play some part in the occurrence of neurosyphilis, it can only be said that the data in question are such as invite fuller confirmation; if correct, they stand alone among clinical data, and are of corresponding importance. The second contribution is extremely suggestive, but that similar considerations apply, in the manner of analogy, to man, and in particular to the problem of neurosyphilis, has yet to be demonstrated.

As yet, then, we can entertain no bias either in favor of the theory of neurotropism or of the alternative hypothesis. We have no real light, after all, on the entire question, for it is no excess of agnosticism to hold that even such suggestive results as those of Brown and Pearce constitute but one tentative step along the road which may ultimately lead to a comprehension of the *raison d'être* of syphilitic disease of the central nervous system.

II. RACE AND THE INDIVIDUAL IN RELATION TO GENERAL PARALYSIS.

Reports in the literature alleging the infrequency or total absence of neurosyphilis among various races or nationalities are common. Many of these reports, however, must be treated with a

certain skepticism, if only on the principle that a universal negative is to be accepted with caution. As Weichbrodt [101] has recently remarked, if Berlin statistics cannot be interpreted without a knowledge of other factors, how much more is this the case with the Balkan states or with Cairo; in the latter instance, he goes on to say, it is often a matter of results obtained by physicians who know neither the language nor the customs of the people in question, and the majority are not sufficiently expert in making a diagnosis of general paralysis, for example, as to enable one to conclude that because the diagnosis is seldom made, therefore the disease itself is infrequent. A sufficiently conspicuous example is furnished by the Chinese, of whom it has been repeatedly stated that in spite of a high incidence of syphilitic infection neurosyphilis of all forms is a much rarer phenomenon than it is among members of the white race. But recent careful surveys do not altogether bear out this conception.

Woods,[102] for example, finds that the incidence of nervous syphilis in China is about the same as in Europe or America. Lennox,[103] in a study in which he reviews the literature, reports that during a three-year period in which a special syphilis clinic was maintained and free use made of the Wassermann laboratory and the lumbar puncture needle, neurosyphilitic cases formed about 3.3 per cent of the new medical admissions in Peking, as against about 1.6 per cent in a group of nine representative American hospitals—syphilis itself being responsible for 8.4 per cent and 2.5 per cent, respectively of the total admissions in the two instances; further, that among the outpatients of all departments during the three-year period, neurosyphilitic cases constituted 0.23 per cent, the same as the average proportion reported by the out-patient departments of three representative American hospitals, syphilis itself accounting for 6.1 per cent and 3.1 per cent, respectively, in the two instances. Thus the incidence of neurosyphilis among syphilitic patients in the Peking Union Medical College Hospital was about six times that reported by a group of fourteen other hospitals in China; and this increased incidence was largely "due to the well recognized relation between seeking and finding: fewer cases in the clinic went unrecognized." On the other hand, Lennox observed a striking difference among the Chinese in the distribution of neurosyphilitic lesions, with special emphasis on cord

[101] Weichbrodt, R.: Die progressive Paralyse und ihre Therapie. Ztschr. f. d. ges. Neurol. u. Psychiat., 1926, *105*, 599.

[102] Woods, A. H.: Types of Cerebro-Spinal Syphilis in China. China Med. Jour. 1922, *36*, 206.

[103] Lennox, W. G.: Neurosyphilis among the Chinese: with findings in sixty-five cases. Arch. Neurol. & Psychiat., 1923, *9*, 26.

lesions of vascular origin. Of 65 patients with proved neurosyphilis, 29 had a transverse myelitis, 16 tabes dorsalis, 14 cerebrospinal syphilis, 5 hemiplegia and 1 general paralysis. "Cases of general paresis are rare, possibly due in part to the fact that they present less urgent symptoms and less obvious physical signs."[104]

In other countries, likewise, the incidence of neurosyphilis has been found on more careful investigation to be considerably higher, in relation to the prevalence of syphilitic infection, than was at one time believed to be the case. Recent publications have shown this to be true, for example, of Turkey and of Java.

Schükry[105] remarks that one finds the view very widespread that in Turkey, and especially in Asia Minor, general paralysis is seldom encountered, although syphilis is extremely common. This view is controverted by the fact that in 147 necropsies general paralysis was found in 37, or 25 per cent. Using modern methods of diagnosis, it was found that general paralysis was present in 7.5 per cent of the male and in 2.5 per cent of the female inmates of the Top-Tachi asylum in Constantinople in 1923; there were 38 paretic admissions during that year, 32 males and 6 females. The previous impression of the infrequency of general paralysis, especially in the interior of Asia Minor, must be ascribed to faulty diagnosis, says this writer. Nevertheless, "we would not dispute the fact that in Asia Minor paresis is less common than in Europe in relation to the prevalence of syphilis."

Gans[106] mentions that Kraepelin found no case of general paralysis among 100 Javanese insane, and Van Brero found only 33 examples among 639 natives admitted to the asylum at Lawang, 1902 to 1909. But Engelhard, in 1919, was able to discover 11 cases of general paralysis among 76 male insane; and Gans himself encountered among 55 male admissions 5 patients who gave the four reactions in the spinal fluid and exhibited Argyll-Robertson pupils.

On the other hand, the incidence of general paralysis among the Egyptians is actually low, if we accept the data of Warnock,[107]

[104] The psychology of the Chinese must here be taken into account; symptoms such as might impel an Occidental to seek medical advice would not necessarily so operate in a Chinese. Impotence, for example, would bring the latter to the clinic much more readily than other symptoms which an American would regard as demanding attention but which a Chinese might disregard. (Dr. A. H. Woods: personal communication.)

[105] Schükry, J.: Ueber die Spatzsche Methode zur Schnelldiagnose der Paralyse und über das Vorkommen von Paralyse in der Türkei. Münch. med. Wchnschr., 1925, *72*, 2011.

[106] Gans, A.: Ein Beitrag zur Rassenpsychiatrie (Beobachtungen an geisteskranken Javanern). Münch. med. Wchnschr., 1922, *69*, 1503.

[107] Warnock, J.: Twenty-Eight Years' Lunacy Experience in Egypt (1895-1923). Jour. Ment. Sci., 1924, *70*, 380.

which he has to some extent controlled by observations upon Maltese living in the same cities as most of the Egyptians reported. This writer believes it "clear that the more civilized races suffer far more from general paralysis than the backward races, as one would expect, as the former are the more completely syphilized," adding, however, that the peculiar racial and geographical distribution of general paralysis has not yet been explained.

In the four cities of Cairo, Alexandria, Port Said and Suez, the Egyptians with general paralysis (454 out of a total of 677) represented 6.2 per cent of the total Egyptian insane admitted to the Abbâsiya Hospital, and 4.1 cases of this disorder per 10,000 of population. But the Maltese, nearly all of whom live in these four towns, had 20 per cent of their insane admitted suffering from general paralysis, representing 18 per 10,000 among the Maltese population. Although the numbers of Maltese are so much smaller than those of the Egyptians (total insane among Maltese only 69) as almost to preclude comparison with the latter, still the percentage of paretics in the total insane among various European nationalities in Egypt is more than double that among the Egyptians (Greeks 15.7 per cent, French 10 per cent, British 13.8 per cent, Italian 13.7 per cent), thus making it apparently indubitable that the rate of general paralysis amongst Egyptians is in reality very low, though the disease does affect this people to a small extent.

The subject cannot be dismissed without some reference to general paralysis in the negro, although it is difficult to reconcile with one another the various data reported, and to arrive at a definite conclusion as to the relative susceptibility to neurosyphilis of members of the negro race. We have, on the one hand, Foster's [108] statement that cases of general paralysis represented 9.6 per cent of the white males and 19.5 per cent of the colored males admitted to the Central Louisiana State Hospital during a given period. Foster also quotes Hoch as having found the average rate for general paralysis in seven large North American mental hospitals to be 11 per cent for white males and 28 per cent for negro males. The latest report of the State Hospital Commission of New York shows that general paralysis was responsible for 17.2 per cent of negro admissions (male and female), as against about 11 per cent of the admissions from all races combined.[109] Such data as these indicate

[108] Foster, R. H.: Paresis in the Negro. Am. Jour. Psychiat., 1926, 5, 631.

[109] Pollock, H. M.: Annual Statistical Review of the Patients Treated in the State Hospitals and Private Licensed Institutions for Mental Disease; for the year ended June 30, 1925. Albany, 1926. See p. 155 and p. 148.

that out of all psychoses responsible for commitment to state hospitals for the insane a larger proportion is contributed by general paralysis among negroes than is the case among whites. But owing to the factor of the incidence of psychoses other than general paralysis and the factor of the incidence of commitment among these, which factors are not necessarily the same among negroes as among whites, it does not of necessity follow from these figures that general paralysis is actually more common in the negro, still less that the syphilitic negro is more susceptible to general paralysis than the syphilitic white. Similarly of the data based upon the population, which show that in New York State in 1924, for example, the rate of general paralysis per 100,000 of negro population was 30.8, but per 100,000 of white population only 7.0.[110] Hence, if syphilis itself were about four times as common among the negroes of New York State as among the whites, then the syphilitic negro, obviously, would be neither more nor less susceptible to general paralysis than the syphilitic white.[111] To avoid the introduction of distorting factors incapable of evaluation, such as data of the foregoing type appear to include, it would seem desir-

[110] Pollock, H. M.: In "Discussion," Am. Jour. Psychiat., 1926, *5*, 639.

[111] It is practically certain that syphilis is considerably commoner among negroes than among whites; how much commoner is, however, not known, although it is often estimated that the incidence is at least two or three times as great. McNeil, for example, in a careful study of some 1200 sick and healthy negroes in Galveston, found the incidence of positive Wassermann reactions among the latter to vary between 25 annd 30 per cent, and among the former between 40 and 50 per cent; but he adds that the occurrence of syphilis among white people of the same social class as the negroes would seem to be about the same as that among the negroes. (McNeil, H. L.: Syphilis in the Southern Negro. Jour. Am. Med. Assn., 1916, *67*, 1001). According to the very comprehensive survey made by Day and McNitt in St. Louis, of 2925 hospital and dispensary patients submitted to a routine Wassermann test during the year 1918, syphilis was considered to be present in 571, or 19.5 per cent; the incidence of syphilis was lowest among the well-to-do, about twice as high among the middle class of society, represented by the pay-ward patients, and about three times as high among the lower social class, or free-ward patients. Syphilis was considered present in 15.9 per cent of 1777 white outpatients and in 40.5 per cent of 473 colored outpatients of both sexes. (Day, A. B., and McNitt, W.: The Incidence of Syphilis as Manifested by Routine Wassermann Reactions on 2925 Hospital and Dispensary Medical Cases. Am. Jour. Syph., 1919, *3*, 595.)

able to determine the actual incidence of neurosyphilis among negro syphilitics as compared with its incidence among white syphilitics. We are fortunate in having available for this purpose the records of 7416 patients with acquired syphilis, admitted consecutively, in an unselected series, to the Syphilis Clinic of the Johns Hopkins Hospital.[112] Briefly summarized, these records show that of 2537 white syphilitics of both sexes, 615, or *24.2 per cent,* and of 4879 negro syphilitics of both sexes, 553, or *11.3 per cent,* presented evidence of neurosyphilis of some form (exclusive of asymptomatic neurosyphilis). It would appear, then, that at least twice as many white syphilitics, proportionately, as negro syphilitics, exhibit some form of clinical neurosyphilis. As regards the various types of neurosyphilis, the data for general paralysis are to some extent affected by the fact that paretics with outspoken mental symptoms do not appear in the Syphilis Department. Whether or not this reservation affects the two races equally in the long run, a diagnosis of general paralysis (including taboparesis) was made in more than eight times as many white syphilitics of both sexes as negro syphilitics; in 111, or 4.3 per cent, of the former, in 28, or 0.5 per cent, of the latter. An almost equal discrepancy obtains in the possibly more accurate data as to tabes, which was found to be more than five times as common in the whites as in the negroes; it was present in 174, or 6.8 per cent, of the former, and in 68, or 1.3 per cent, of the latter. Acute meningeal syphilis was present in 3.2 per cent of the whites, and in 1.3 per cent of the negroes. On the other hand, all other forms of neurosyphilis (diffuse meningovascular neurosyphilis, vascular neurosyphilis, etc.) made up 9.7 per cent of the white syphilitics of both sexes (*i. e.,* 247 cases), and 8.0 per cent of the colored syphilitics of both sexes (*i. e.,* 392 cases). In the light of these careful findings, it is difficult to doubt, irrespective of the figures for actual admissions to state hospitals on the part of patients with general paralysis, that white males

[112] These cases make up the majority of a series of 10,000 cases which are to be incorporated in a report to be published by Dr. T. B. Turner. We are greatly indebted to the kindness and cooperation of Dr. Joseph Earle Moore and of Dr. Turner in going to the trouble of placing these valuable data at our disposal in advance of their publication in full.

and females are, if they acquire syphilis, considerably more liable to *parenchymatous* neurosyphilis than are negroes.[113, 114]

The malaria treatment of general paralysis has raised the question whether the endemicity of malaria in certain tropical and sub-tropical countries is not responsible for the low incidence of general paralysis in comparison with a high incidence of syphilis in these countries. It has lately been suggested that this may very possibly be the case, although it has by no means as yet been proved, we should say, that malaria acquired or recurring subsequent to syphilitic infection acts either invariably or even with any regularity as a prophylactic against the subsequent development of parenchymatous neurosyphilis; the experience reported by Kirschbaum seems rather strikingly to run counter to too rigid an assumption of this sort.[115] But, among many others, Schükry [105] makes reference to this possibility, stating that malaria is almost universal in Asia Minor, and suggesting that this fact may be related to the low incidence of general paralysis in proportion to that of syphilis in that country as compared with Europe. Gans [106] likewise suggests that the malaria which every native of Java has once to several times during the ten years subsequent to syphilitic infection acts prophylactically against subsequent nervous system involvement. Bercovitz [116] is certain that in spite of the fact that syphilis is one of the commonest diseases in Hainan (in tropical China), he has seen only two or three cases of tabes and not a single case of general paralysis in eight years; and he suggests a possible connection between this fact and the fact that tertian and estivo-autumnal malaria is so universal that probably 90 per cent of the 3,000,000 inhabitants of Hainan have one or more attacks of malaria during the course of a year. And

[113] Negro females appear to reduce the incidence of neurosyphilis in negroes somewhat more than white females affect the incidence of neurosyphilis among whites. If, then, males alone are considered, we have that paresis is found in 5.0 per cent of the syphilitic white males, and in 0.9 per cent of the syphilitic negro males—a ratio of about five to one; tabes in 8.7 per cent of syphilitic white males, and in 2.4 per cent of syphilitic negro males—a ratio of about three and one-half to one.

[114] The data of Moore, already cited,[5] point in the same direction as regards relative susceptibility to *early* neurosyphilis; he found, in all, 19 positive spinal fluids in 123 negroes with primary or secondary syphilis (15.4 per cent), with only 2 of the Group III (paretic) type, as against 53 positive fluids in 207 white patients with early syphilis (25.6 per cent), with 15 fluids of the Group III type.

[115] This writer mentions ten paretics, all of whom gave a definite history of having had malaria subsequent to contracting syphilis (Kirschbaum, W.: Ueber Malaria- und Recurrensfieber-Behandlung bei progressiver Paralyse. Ztschr. f. d. ges. Neurol. u. Psychiat., 1922, *75*, 635).

[116] Bercovitz, N.: Neurosyphilis and Malaria. Correspondence, Jour. Am. Med. Assn., 1924, *82*, 1713.

de Bellard[117] likewise sees a connection between the prevalence of malaria and the absence of general paralysis; for he states that, on the one hand, the malarial plasmodium is present in the blood of 48 per cent of the workmen in the lowlands about Lake Maracaibo in Venezuela, and on the other hand, having for four years seen about 1000 patients a month, 50 per cent of whom were syphilitic, he has never encountered a case of general paralysis. Heinemann[118] similarly explains the fact that in Java (but *cf.* Gans[106]) he saw nine cases of meningo-vascular neurosyphilis, but no cases of tabes or general paralysis. It is thus not altogether out of the question that in tropical and sub-tropical malarious countries the prevalence of this infection does operate as one factor in reducing the incidence of general paralysis relative to the incidence of syphilis in the population.[119]

Whether it be true, as it appears to be, that different races vary materially in their susceptibility to syphilitic involvement of the nervous system, and whatever may be the causes which underlie this variation, it may perhaps be hazarded that general paralysis does not make its appearance among a given people until syphilis has been present among that people for a long period of years. At least it is possibly the case that general paralysis has not existed in Europe for much longer than two hundred and fifty years,[120]

[117] de Bellard, E. P.: Gac. Méd. de Caracas, 1925, *32*, 193. (Quoted by Rudolf. Abstr. in Jour. Am. Med. Assn., 1926, *86*, 157.)

[118] Heinemann, H.: Untersuchungen über den Liquor cerebrospinalis. Arch. f. Schiffs- u. Trop.-Hyg., 1924, *28*, 187.

[119] See further: Rudolf, G. de M.: *Therapeutic Malaria.* Humphrey Milford, Oxford University Press, London, New York, etc., 1927; pp. 54-59.

[120] This statement is based upon the belief that John Haslam described in 1798 the first case of undoubted general paralysis recorded in medical literature, the perhaps somewhat questionable assumption being that a disease characterized by the rather striking mental symptoms presented by some case of general paralysis could not have gone unnoticed and unrecorded for many decades. On this assumption it is supposed that the existence of general paralysis in Europe did not antedate by any very extensive period of time its first recording in medical literature.

"It has been suggested that general paralysis had been observed before the publication of Haslam's case. These suppositions are based on accounts of the sequence of mental excitement and fatuity, or of the association of paralysis and enfeeblement of the mind or memory, or of the presence of meningitis and excess of cerebrospinal fluid. In all of the instances given the account is vague and meager, or there is some important hiatus. In none is there that certainty of diagnosis which is universally conceded to the case described by Haslam." Among these alleged precursors of Haslam were Thomas Willis (1672), who may possibly refer to general paralysis, although "it is much more likely that he refers to senile or arteriosclerotic dementia

even though we do not know how long syphilis itself had previously existed among Europeans;[121] yet despite some uncertainty on the first point and much uncertainty on the second, it is at least clear that general paralysis was not observed in Europe, and it is within the bounds of possibility did not exist, until syphilis had been prevalent for many years or centuries.

Conversely, we have in the natives of Bechuanaland an example of a people, the date of the introduction of syphilis among whom can be stated with some confidence, for its wholesale introduction

followed by apoplexy and softening"; Littre (1705); Geoffroi (1706); and Meckel (1764). On the other hand, as is well known, A. L. J. Bayle, in 1822, in his thesis, *Recherches sur les Maladies Mentales,* was the first to give "a description and a conception of general paralysis which approximates in its essential features to our present-day views of that disease," since he co-related the mental derangement and the paralysis, which he said were the associated symptoms of one disease and progressed on parallel lines through all its stages, and gave an accurate and fairly complete description of the pathological anatomy of general paralysis, and was thus the first to suggest "that these associated mental and motor symptoms and these pathological changes of the meninges and the brain were proofs of the presence of a definite disease—of a distinct pathological entity." (For this account we are indebted to the excellent article of G. M. Robertson: The Discovery of General Paralysis. Jour. Ment. Sci., 1923, *69*, 1.)

[121] According to the theory of the American origin of syphilis, the disease was introduced into Europe at the end of the fifteenth century having been brought back to the Old World in 1493 by Columbus's sailors. This theory is well set forth by Iwan Bloch: "The History of Syphilis," in *A System of Syphilis,* edited by D'Arcy Power and J. Keogh Murphy, 2d ed., Henry Frowde, London, 1914; vol. I, ch. 1, pp. 3-43.

That greatest of authorities on the history of medicine, Karl Sudhoff, holds, however, that direct proofs of the importation of syphilis from America in March and April, 1493, are non-existent; he himself has examined documentary material in several south German cities and finds no trace of a violent epidemic of syphilis having raged throughout Europe between 1495 and 1500, as has so often been alleged; "nor are there any proofs of its existence in America before October 12, 1492, when the ships of Columbus reached the Bahama Islands for the first time, nor prior to October 28, when he landed in Cuba." Indirect proofs are also inconclusive and unconvincing. According to Sudhoff we are as far removed from the knowledge of the origin of syphilis as from that of all other infectious diseases. (Sudhoff, Karl: "The Origin of Syphilis," in *Essays in the History of Medicine.* Translated by various hands and edited, with foreword and biographical sketch, by Fielding H. Garrison. Medical Life Press, New York, 1926; pp. 259-273.)

coincides with the commencement of labor activity in the diamond fields about 1874; the subsequent behavior of the disease in these people has been closely observed and reported upon by McArthur.[122] This writer notes in particular, among the variations in symptomatology exhibited by the native of Bechuanaland as compared with the European, a high incidence of *syphilis hereditaria tarda,* accompanied by a very low incidence of miscarriages and abortions, and a low infant mortality; he believes, in fact, that only a small proportion of the cases of syphilis among this people is of the acquired type, and that, indeed, case-to-case infection without sexual intercourse gives rise to the major portion of such acquired syphilis as is met with. At all events, syphilis among these natives is characterized by the "extreme destructive severity of the so-called tertiary cutaneous lesions," and at the same time by the very inconspicuous character of constitutional manifestations accompanying these, by the rarity of involvement of the deep viscera, and by the practically complete absence of implication of the cerebrospinal axis; regarding the last, the writer states that he "has met with only six cases [out of more than fifteen hundred] with pronounced nervous lesions, and tabes dorsalis and dementia paralytica have never been seen." Fraser has remarked of this type of observation: "In the natives of South Africa the mild primary stage which is characteristic, and which is frequently absent, is due to a lack of local cell reaction around the attacking organism and not to any inherited immunity. The cell reaction is seen in the generalization stage when cutaneous syphilides are particularly severe. The antibody mobilized at this period seems to act as a bulwark of defense for the nervous system, which subsequently is never involved to an extent sufficient to produce clinical symptoms."[123]

From observations of the sort here reviewed it might be inferred that after some centuries of syphilization a partial immunity towards syphilis is developed, analogous perhaps to the partial immunity to measles and to tuberculosis which the white race has

[122] McArthur, D. C.: Syphilis As We See It Among the Natives of Bechuanaland Today: Being a study of some 1547 cases of syphilis occurring among the native tribes of Taung, extending over a period of six years. Am. Jour. Syph., 1923, *7,* 569.

[123] Fraser, A. R.: Some Account of the Responsibility of Intensive Treatment Methods with Regard to the Incidence of Early Neurosyphilis. Am. Jour. Syph., 1921 *5,* 201; *vide* pp. 209, 210.

acquired. In the presence of this partial immunity less intense defense reactions are called forth by the infection, and these reactions may fail to confer protection on the nervous system, as they might have done had they been, as apparently in the case of the natives of Bechuanaland, of a more intensive character. This may account, if we do not argue beyond the facts, for the ultimate appearance of neurosyphilis in a race which for centuries has been exposed to syphilis; although it does not account, except by a quite unproved and hypothetical analogy, for the relatively sporadic occurrence of syphilitic involvement of the nervous system in a race in which neurosyphilis has by some process become established.

We shall not discuss the question whether the introduction of arsenicals into the treatment of syphilis has been responsible for an increase in the incidence of neurosyphilis. That this is so is firmly believed by a number of observers, the assumption being that arsenical treatment interferes with, because acting as a substitute for, the calling into play of the defensive mechanisms of the body, yet at the same time failing to accomplish a sufficiently complete sterilization of the tissues of the host—much as in Brown and Peace's experimental animals a single dose of arsenical seemed to nullify any protection that had been developed and render subsequent reactions on the part of the animal less effectual. Apropos of the foregoing, one notes Fraser and Duncan[134] citing Mehliss as stating that, in his experience with over 160,000 syphilitic natives in South Africa, neurosyphilides of even the mildest variety have only appeared among these natives since the introduction of arseno-benzene into the treatment routine; these writers believe this phenomenon to be due to "sudden sterilization of the general systemic circulation, with resulting paucity of antibody supply to the cerebrospinal axis," so that "the parasites which have invaded the central nervous system are not killed, but are left free from antibody molestation to attack the harboring tissues at will."

Turning, then, to what is known of the individual in relation to syphilitic disease of the central nervous system, we have available the single fact that in the case of general paralysis males are more prone to this type of manifestation than are females, and this in the ratio of, roughly, at least three to one; while tabes shows a similar, though perhaps less marked, inequality. Nor is this undoubted fact in any degree ascribable to a difference in the incidence of syphilis in the male as compared with the female population, for no such difference exists.

[134] Frazer, A. R., and Duncan, A. G. B.: A Possible Explanation of the Increased Incidence and Early Onset of Neurosyphilis. Brit. Jour. Derm. & Syph., 1921, *33*, 251-281.

On the latter point Vedder [125] cites exhaustive data, of which some of the most representative may be summarized here. At Bellevue Hospital for the year 1915, during which routine Wassermann tests were largely made, 27.0 per cent of 4085 male patients on the medical and surgical wards gave a definitely positive Wassermann reaction, this being true of 27.1 per cent of 1752 female patients on medical and surgical wards. At the Post-Graduate Hospital of New York during the year 1916, 28.4 per cent of 1168 unselected white male patients, and 27.4 per cent of 746 white female patients, gave a definitely positive Wassermann reaction. From routine examinations carried out at the Chicago Tuberculosis Hospital during the three years 1915-1917, it was found that 7.2 per cent of 1395 males, and 5.7 per cent of 1399 females, gave a strongly positive Wassermann reaction. Among the private patients of a number of physicians in Washington, 5.3 per cent of 430 men, and 4.1 per cent of 417 women gave a definitely positive Wassermann reaction. Solomon and Solomon [126] have collected and tabulated a large number of data, including some of those cited by Vedder, and also including some where the equality of females with males is less marked; so that their grand total gives 25.6 per cent of 7155 men, and 20.7 per cent of 4227 women, with a positive Wassermann reaction.

With reference to the sex incidence of general paralysis, we may cite the older figures of Junius and Arndt, who found that during the 10 years 1892-1901 there were admitted to the Dalldorf asylum 2425 male and 1029 female cases—a ratio of nearly 2.4:1.[127] Among the 4139 patients cited by Bucura,[128] the ratio of men to women was 3.15:1. Günther [129] states that this ratio was 3.39:1 among 151,587 paretic admissions to the German mental hospitals, 1883-1916. Turning to the statistical report of the New York State Hospital Commission for the year ended June 30, 1925, we find that during the fifteen years 1911-1925 inclusive, there were admitted to the New York state hospitals, as first admissions, 9615 men and 2450 women suffering from general paralysis; that is, of the 12,065 cases, males constituted 79.7 per cent and females 20.3 per cent; so that male paretics outnumbered female in the ratio of almost exactly 3.9:1.[130] From the Syphilis Clinic of the Johns Hopkins Hospital, Moore [131] reports that a

[125] Vedder, Edward B.: *Syphilis and Public Health.* Lea and Febiger, Philadelphia and New York, 1918; especially pp. 55-71.

[126] Solomon, H. C., and Solomon, M. H.: *Syphilis of the Innocent: A study of the social effects of syphilis on the family and the community.* U. S. Interdepartmental Social Hygiene Board, Washington, 1922; Table 2, p. 18.

[127] Junius and Arndt: *loc. cit.* (footnote 67), pp. 254, 255.

[128] Bucura, K.: *Geschlechtsunterschiede beim Menschen.* Leipsic, 1913. (Cited by Günther (footnote 129), p. 12).

[129] Günther, H.: Die Bedeutung der Sexualdisposition bei Erkrankung en des Nervensystems. Deutsch. Ztschr. f. Nervenheilk., 1926, *90*, 1.

[130] Pollock, H. M.: *Loc. cit.* (footnote 109), p. 144.

[131] Moore, J. E.: Studies in Asymptomatic Neurosyphilis. III. The Apparent Influence of Pregnancy on the Incidence of Neurosyphilis in Women. Arch. Int. Med., 1922, *30*, 548.

diagnosis of general paralysis was made on 207 males and 49 females, representing a ratio of 4.2:1; he states that these figures are more accurate than those usually given, since they are based on the total number of male and female patients with syphilis rather than on neurosyphilitics only. Taking these extensive figures, together with others which need not be cited, there can be no doubt that general paralysis is at least three times as common among men as among women, while syphilis itself is to be found with very nearly the same frequency among women as among men.

As to tabes, it may be noted that among the 7583 cases collected from the reports of seven observers by Günther,[129] the ratio of men to women was 2.5:1 (5413 males, 2170 females). In Moore's clinic, there were 140 men and 22 women diagnosed tabes, a ratio of 6.4:1.[121] Of 500 successive cases of tabes which presented themselves at the outpatient department of the Massachusetts General Hospital, 427 were men and 73 women, a ratio of 5.85:1.[99]

For all types of clinical neurosyphilis, Moore[121] reports that 20.38 per cent of the total syphilitic males, but only 6.47 per cent of the total syphilitic females, were so diagnosed upon admission to the Syphilis Department—a ratio of 3.31:1. Among the 7416 syphilitics from this clinic, previously referred to,[112] there were 27.6 male neurosyphilitics per 100 male syphilitics and 18.0 female neurosyphilitics per 100 female syphilitics among the white patients—a ratio of 1.53:1; 16.8 cases and 7.1 cases, respectively, among the negroes—a ratio of 2.37:1; for the two combined, the ratio was 2.22:1. Among the whites, the ratio of males to females was 1.61:1 in the case of general paralysis, and 2.56:1 in the case of tabes. Among the negroes, this ratio was 4.45:1 for paresis, 4.80:1 for tabes. For both groups of patients, the ratio was 3.00:1 in the case of general paralysis, and 4.25:1 in case of tabes.

General paralysis, then, appears to join that interesting group of diseases of which the incidence is materially different in the two sexes; and the same is true of tabes.[132] In the great majority of

[132] This is not the place in which to discuss the interesting and somewhat neglected subject of the sex incidence of disease. For recent discussions of the topic, the reader is referred to Draper, George: Influence of Sex upon the Constitutional Factor in Disease. N. Y. State Jour. Med., 1925, *25*, 1065; and Günther (footnote 129). In the field of psychiatry we may remind the reader, however, that manic-depressive psychosis (as will be mentioned later) exhibits a rather well marked difference in incidence in the two sexes. Taking, for example, the data given on page 146 of the 1925 Statistical Review,[109] it is seen that of the 13,676 patients diagnosed manic-depressive psychosis admitted to the state hospitals of New York during the seventeen years 1909-1925, 63 per cent were females (8611), and 37 per cent were males (5065), a ratio of about 1.7:1. For European data, Günther cites a ratio of 2.7:1 among 585 patients with manic-depressive psychosis. It is also of interest, though scarcely relevant to the present discussion, to note the

such instances, however, the causes of this sex difference in the predisposition to disease is wholly obscure; but in the case of general paralysis some light has been thrown on the question by the studies of Moore.

Moore had noted that the incidence of spinal fluid abnormalities was the same in women with primary or secondary syphilis as in men; namely, 22.1 per cent of 113 women and 21.6 per cent of 217 men.[3] This appears to demonstrate satisfactorily that in the first year or two of the disease the nervous systems of both sexes are equally liable to invasion by the syphilitic organism. When, however, *late* syphilitics without demonstrable neurologic abnormalities were considered from the standpoint of the incidence of abnormal spinal fluids in women as compared with men, Moore found that this incidence was 21.03 per cent in the case of the men, 309 in number, or almost exactly the same as in early syphilis in men, whereas it was only 16.3 per cent in the women, 233 in number, as compared with an incidence of 22.1 per cent in early syphilis in women; thus, in women, spinal fluid changes are less frequent in late than in early syphilis (whereas in men they are of the same frequency).[131] Now, "if pregnancy is a factor of importance in causing this lowered incidence, those women with late syphilis who have been pregnant since their infection should show a lower pro-

distribution between the sexes of the several types of mental reaction produced by the same morbific agent, alcohol. It can be computed from Table 10 of the Statistical Review of 1924 (p. 182) and of 1925 (p. 192) that during these two years there were admitted to the state hospitals of New York with a diagnosis of some form of alcoholic psychosis 643 males and 152 females, representing a ratio of 4.2: 1. This male preponderance was even greater in the case of alcoholic hallucinosis: 319 men to 50 women, or a ratio of 6.4: 1. But in the case of Korsakoff's psychosis, there were admitted 48 men and 47 women as first admissions during these two years: a ratio of 1: 1. Obviously, among alcoholics, or at least among the subjects of alcoholic psychoses, Korsakoff's psychosis is considerably commoner in women than in men. Or, stated in relative rather than in absolute terms, of 152 women admitted during these two years on account of an alcoholic psychosis, 31 per cent were diagnosed Korsakoff's psychosis; but of 643 men similarly admitted, only 7.5 per cent were so diagnosed: among the alcoholic psychoses, Korsakoff's psychosis was four times as common in the women as in the men, whereas alcoholic hallucinosis (making up 49 per cent of the total alcoholic male first admissions, and 33 per cent of the total alcoholic female first admissions) was one and one-half times as common in the men as in the women.

portion of abnormal fluids than those who have never been pregnant." What Moore actually found was that of 90 late syphilitic women who had never been pregnant, or who had borne children only before infection with syphilis, 22.2 per cent had abnormal fluids—exactly the same proportion as that observed in early syphilis, or in men in both early and late syphilis; but of 142 cases in which pregnancy had occurred one or more times after infection, only 11.2 per cent were thus abnormal. Thus, "the proportion of spinal fluid abnormalities in late syphilis, when no pregnancies have occurred, is precisely the same as that observed in early syphilis. In pregnant women, this percentage is reduced by half." [121]

Moore's observations indicate that "the usual early manifestations of syphilis are markedly altered by the occurrence of pregnancy. A woman infected at or shortly after the time of conception usually does not develop a chancre or secondary syphilis. When infection takes place late in pregnancy, on the other hand, the usual course of events may follow, but is often much delayed." One may ask, says Moore, if pregnancies occurring some time after infection confer the same sort of protection against the development of grave syphilitic lesions as pregnancy ensuing when conception and infection occur more or less simultaneously, and whether repeated pregnancies protect even more than a single one. As to the first interesting point, Moore states that no information is at present available. Regarding the second, he finds a suggestion that repeated pregnancies confer a higher degree of protection than a single one; for spinal fluid abnormalities were present in 22.2 per cent of 90 nulliparous late syphilitic women (as already noted above), and in 19.5 per cent of 41 women who had had one pregnancy subsequent to infection, but in only 9.3 per cent of 96 women who had had two or more such pregnancies.

In sum, then, Moore finds (1) that clinical neurosyphilis is about three times as frequent in men as in women, but (2) that the nervous systems of the two sexes are invaded with equal frequency in the early stages of syphilis, as is shown by the relative percentages of spinal fluid abnormalities. Since (3) the course of early syphilis is markedly altered by the simultaneous occurrence of pregnancy, since (4) in women with late syphilis (of more than one year's duration) the incidence of abnormal spinal fluids was about twice as high in a group of nulliparous women as in a group of those in whom one or more pregnancies had occurred since infection, and since (5) almost half of the women who were clinically neurosyphilitic had not been pregnant since infection, while (6) multiparæ seemed to be somewhat less liable to late asympto-

matic neurosyphilis than primiparæ—the suggestion is that pregnancy is one factor which may partially account for the comparative freedom of women from neurosyphilis.[133]

The study made by Solomon [135] from a somewhat different standpoint does something to bear out this conception. Solomon investigated the history of pregnancy in 559 syphilitic women admitted to the Boston Psychopathic Hospital, who were over thirty years of age. Of 205 women diagnosed as paretic (191) or tabetic (14) neurosyphilis, 93, or 45.4 per cent, were nulliparæ; but of 275 women who had syphilis without involvement of the central nervous system, 73, or only 26.5 per cent were nulliparæ. On the other hand, of the neurosyphilitic group 54.6 per cent, while of the non-neurosyphilitic group 73.5 per cent, had had one or more pregnancies. Of the first group, 35.1 per cent had had two or more pregnancies, 23.9 per cent three or more; of the second group, 56.4 per cent had had two or more pregnancies and 40.1 per cent had had three or more. Of the two possible inferences, that women who develop neurosyphilis become less fertile than women with a non-neurologic form of syphilis, a possibility that has received frequent mention in the past, or, on the other hand, that women who become

[133] At the same time, it is not suggested, writes Moore, that pregnancy occurring some time after infection, the woman having passed through the usual course of early syphilis, may exert any influence on the subsequent development of neurosypilis. For whether this is so or is not so has not been determined.

Moore has elsewhere reported,[134] in a study which, as he says, is an amplification of the conclusion reached by Jonathan Hutchinson, that if impregnation and infection coincide, or if infection occurs during the course of pregnancy, the patient may develop the usual early manifestations of syphilis, which are, however, much milder than if she is infected independently of pregnancy; but a slightly larger proportion of women (in his material), if infected with syphilis at about the time of impregnation, fail to develop any of the usual early lesions of syphilis. Yet this suppression of the early lesions of syphilis which conceptional infection seems often to bring about does not, as apparently frequently in the male, appear to render the nervous system more susceptible to invasion. Rather, the factor of pregnancy seems in some way to alter the defense mechanism so that the reverse is the case.

[134] Moore, J. E.: Studies on the Influence of Pregnancy in Syphilis. I. The Course of Syphilitic Infection in Pregnant Women. Bull. Johns Hopkins Hosp., 1923, *34*, 89.

[135] Solomon, H. C.: Pregnancies as a Factor in the Prevention of Neurosyphilis. Am. Jour. Syph., 1926, *10*, 96.

pregnant receive thereby in many instances a certain protection against the spirochæte and its attack upon the nervous system—of these two possible conclusions the second is that which Moore has suggested, one which, as Solomon writes, "seems so obvious that one wonders why it was not considered long ago." Or, as Moore himself has expressed it, women are not sterile because they are paretic; rather it appears that they are paretic because they are sterile.

In conjunction with the fact that the sex distribution of general paralysis appears to be due to a sex difference not more fundamental than the phenomenon of pregnancy, it is certainly of interest that in the congenital form of the disease (juvenile paresis), on the other hand, the two sexes are about equally represented.[136]

Brown and Pearce[137] have obtained interesting experimental results with regard to the influence of pregnancy upon syphilitic infection in rabbits, which should be mentioned in this place. Eight control animals were inoculated intradermally, and reacted to the inoculation by the prompt development of characteristic indurated lesions at the site of inoculation and a well marked lymphadenitis. Of eight pregnant females inoculated in the same way and with the same strain of organism, four showed no clinical sign of infection whatever, as though the defensive mechanism of the pregnant animal were capable of opposing a very effective resistance to inoculation performed at the time of conception. In the only animal in which a lesion was produced comparable to those of the controls, the inoculation was made during the middle of pregnancy; the lesion, however, did not appear until towards the end of lactation, fifty-four days after inoculation. In the remaining three, the reaction consisted of a very slight and transient infiltration at the site of inoculation, unaccompanied by lymphadenitis; but two of these three animals, in which the local reaction just referred to was most marked, exhibited profound constitutional disturbances as well, each giving birth to a dead fetus, while only one of the fifteen young born of these two females survived the first week of life—as though in these two animals, the writers suggest, there had been an ineffectual resistance to the infection or a breaking down of the defensive mechanism. So far as these observations go, there appears to be a rather definite parallelism between the behavior of syphilitic infection in pregnant rabbits and that of an infection coexistent with pregnancy in women,

[136] Schmidt-Kraepelin[29] found only a slight preponderance of males among juvenile paretics. In Alzheimer's tabulation of 41 cases, and also in Klauder and Solomon's[43] series of 23 cases, the ratio was 1:1; in Wollburg's series of 33 cases collected from the literature the ratio of males to females was 6:5.

[137] Brown, W. H., and Pearce, L.: On the Reaction of Pregnant and Lactating Females to Inoculation with Treponema pallidum—A Preliminary Note. Am. Jour. Syphilis, 1920, *4*, 593.

as observed by Moore, in which case, as already noted, there often occurred a suppression of clinical manifestations or a considerable delay in their appearance.

No adequate information is available regarding the mechanism whereby pregnancy, especially when syphilitic infection takes place early in its course, confers a degree of protection against some of the manifestations of the disease, suppressing altogether or considerably delaying the primary and secondary symptoms, and in particular, as we have seen, serving apparently to reduce materially the incidence of late neurosyphilis, both clinical and asymptomatic. Moore has remarked that, as is well known, women during the period of gestation are more resistant to chronic infections than at any other time; "but in no other disease than syphilis does this protection extend over a period of years."[134] One recalls that the thyreoid gland is believed to have some such protective function, and that the thyreoid is known to become enlarged during pregnancy. Solomon expresses the matter in general terms by saying: "Changes in the metabolism of a syphilitic patient may affect his ability to protect the nervous system from the attacks of the spirochæte. Pregnancy, with its metabolic concomitances, may be an example."[135] And he calls attention to the observation made by Mattauschek and Pilcz, that those syphilitics who had a severe febrile disease early in the course of their syphilitic infection showed a very low incidence of neurosyphilis compared with those who escaped febrile disease[136]—"another instance of an upset in the patient's normal metabolism seeming to increase his ability to protect the nervous system against the spirochæte."[135] One outstanding alteration of the blood chemistry in pregnancy, notes Moore,[134] is a marked increase in the cholesterol content of the blood.[139]

[136] Mattauschek and Pilcz state that of the 195 officers who eventually developed general paralysis there was not one who gave a history of having had an acute infectious disease, such as malaria, pneumonia and erysipelas, during the first few years after acquiring their syphilitic infection (footnote 1, first reference); whereas of 241 syphilitic patients who had an acute infectious disease during that period, not one developed general paralysis (footnote 1, second reference).

[139] Moore states that Routh has suggested that chorionic ferments cast into the maternal circulation may be the factor which suppresses the lesions of syphilis (Routh, A.: Latent Syphilis in Pregnancy. Proc. Roy. Soc. Med.,

Of the metabolism of cholesterol, a substance present in every cell of the body, little is known. It is certain, however, that with this metabolism the adrenal cortex is in some way connected; but it is less certain whether the adrenal cortex is the site of formation of cholesterol, cholesterol esters and other lipoids, in which the cortex, and especially the so-called fascicular layer, is so rich, or whether this organ is essentially an organ of storage for cholesterol and cholesterol esters preformed in the blood, from which the blood, according to need, removes the necessary amounts to lipoid.[140] The weight of evidence appears to favor the latter supposition. A relationship between the adrenal cortex and infectious processes has long been suspected from (*a*) the constancy of adrenal lesions in acute infections, (*b*) the disappearance of its characteristic lipoids in acute infections, and (*c*) the hypertrophy of the adrenal cortex in chronic pyogenic processes.[141] And Scott has shown experimentally that in rats the adrenal cortex exerts a protective action against bacterial intoxication, in that the resistance of rats to bacterial intoxication is greatly decreased after double adrenalectomy.[142] Yet, although this decreased resistance appears to depend upon a functional insufficiency of the adrenal cortex, it is unproved, and seems unlikely, in Scott's opinion, that the protective function of the adrenal glands is due to a direct detoxicating action on their part (as has sometimes been assumed), for the alternative explanation that the susceptibility of adrenalectomized animals is due to a fundamental metabolic effect of the cortical insufficiency seems to correspond more closely to the type of reaction observed;[142] Stewart also speaks of the effect of drugs and bacterial toxins, to which the adrenal cortex is so susceptible, as not proving for it a general "detoxicating function."[143]

Sect. Obs. and Gyn., 1921, *14*, 209). "This point," adds Moore, "while interesting, has as yet received no scientific proof. The very existence of such ferments has not as yet been definitely confirmed.

"The third striking difference between pregnant and non-pregnant women consists of definite changes in certain of the endocrine glands. The possibility that these changes might suppress the lesions of any infection is, however, remote."

[140] Aschoff, Ludwig: *Lectures on Pathology*. Paul. B. Hoeber, Inc., New York, 1924; Ch. V: "The Normal and Pathological Morphology of the Suprarenals," pp. 101-131.

[141] Scott, for example, reports finding in 100 cases of death associated with severe infections a marked reduction of anisotropic lipoids in the adrenal cortex, as compared with an abundant load of lipoids present in brain tumor, cardio-renal, and other cases uncomplicated by severe infection. (Scott, W. J. M.: Adrenal Lipoids in Pathological Conditions. J. Med. Research, 1923-24, *44*, 109.)

[142] Scott, W. J. M.: The Influence of the Adrenal Glands on Resistance. II. The Toxic Effect of Killed Bacteria in Adrenalectomized Rats. J. Exp. Med., 1924, *39*, 457.

[143] Stewart, G. N.: Adrenalectomy and the Relation of the Adrenal Bodies to Metabolism. Physiol. Rev., 1924, *4*, 163.

It is of some interest, perhaps, in this connection that in pregnancy the adrenal cortex, besides storing up a strikingly large amount of lipoid substances in the glomerular layer, undergoes a true hypertrophy which is to a large extent permanent; in spite of some puerperal regression, there remains in the parous female, as compared with the male, a definite hyperplasia of the adrenal cortex, especially of the glomerular layer.[140] (It might be mentioned that in the fatty change following upon a cholesterol-rich diet there is also a fat storage in the glomerular layer, but true hypertrophy does not occur, as in pregnancy.) [140] The sex difference just referred to is exhibited also by the *pars anterior* of the pituitary gland, in which there is said to occur in pregnant women, as compared with the situation in the non-pregnant, an increase in the weight of the gland, together with a conspicuous change in the proportions of its constituent cells, due to an immense increase in the chief cells (*Schwangerschaftszellen*).[144] Finally, it is of interest to note that Rogoff and Stewart[145] have shown that pregnancy materially increases the survival period of dogs from which both adrenals have been removed. Thus, out of seventeen pregnant dogs, eight lived more than 17 days and five about 13 to 15 days, whereas among the seventy-four controls not a single dog reached 15 days, and only two lived into the 15th day; but "the decisive difference is the relatively large number of very long survivals (several or many weeks), a feature not seen at all among the controls." These workers were able to demonstrate conclusively, moreover, that it was not the adrenals of the embryos, or not these solely, which constituted the protective mechanism against adrenal insufficiency in pregnant dogs. Furthermore, the survival for 36 and 32 days of two dogs in which the second adrenal was removed about three weeks after the beginning of the proœstrum and shortly before the end of œstrus, respectively, suggests that the changes connected with prooestrum and œstrus exert an influence in neutralizing for a time the effects of adrenal insufficiency; "if this is the case, the influence of the œstrous cycle may be concerned in the protective effect of pregnancy." "The obvious question, whether in the male an influence on the survival period can be obtained, for example, by procedures calculated to cause hyperplasia of the interstitial cells of the testis, or even by restricting or encouraging the functional activity of the spermatogenous tissue, can only be answered by experiment." [146]

In connection with pregnancy and its apparent relation to the modifying of the course of syphilitic infection, and in connection with the functional

[144] Erdheim, J., and Stumme, E.: Ueber die Schwangerschaftsveränderung der Hypophyse. Beitr. z. path. Anat. u. allgem. Path., 1909, *46*, 1.

[145] Rogoff, J. M., and Stewart G. N.: Studies on Adrenal Insufficiency. III. The Influence of Pregnancy upon the Survival Period in Adrenalectomized Dogs. Am. Jour. Physiol., 1927, *79*, 508.

[146] The reader is referred also to:

Stewart, G. N.: Adrenal Insufficiency. Endocrinology, 1921, *5*, 283.

Gibbs, C. E.: The Suprarenal Cortex and Blood Cholesterol in Dementia Præcox. Am. Jour. Psychiat., 1925-26, *5*, 189.

relationship to pregnancy of certain of the endocrine glands, it is certainly appropriate to call attention to the experimental work of Brown and Pearce on the influence of syphilis in rabbits upon various of the glands of internal secretion.[147] These workers showed that, apart from any *localized* lesions which might be attributed to syphilis, there were definite changes in the weights of such organs as the thyreoid, parathyreoids, suprarenals, hypophysis and thymus; and the majority of these organs showed distinct changes in appearance and structure which were especially noticeable in the thyreoid, the parathyreoids and the thymus. The direction and magnitude of these changes, moreover, were, in general, proportioned to and parallel with the resistance displayed by different groups of animals. And finally, Brown and Pearce found that the changes which took place as the disease was brought under control and immunity was established were of a more or less permanent character, so that such organs as the thyreoid, the parathyreoids, the suprarenals and the thymus did not then revert to their normal size and appearance, but maintained a condition suggestive of a higher plane of functional activity and of a change in the general relationship of one organ to another. These experiments, they believe, point to the possible importance of this system of organs whenever the factor of constitutional predisposition or resistance enters into the problem of etiology or resistance to disease; and they add that "it is not unlikely that differences in individual susceptibility and differences between the sexes and between pregnant and non-pregnant women, or even racial peculiarities of the disease, may be explainable upon this basis." Finally, "it appears that the maintenance of immunity is in some way dependent upon the functioning of this mechanism at a new and probably a higher level which is necessitated by the presence of an infection which must be kept under continuous control."[148]

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[147] Brown, W. H., and Pearce, L.: Animal Resistance and the Endocrine System of the Rabbit in Experimental Syphilis. Proc. Soc. Exp. Biol., 1922-23, *20*, 476.

[148] Clinical observations touching the possible relationship between neurosyphilis and the endocrine organs are so few and so inconclusive that they may be relegated to a footnote. The subject has been well covered in a recent article by Zabriskie (Zabriskie, E.G.: Certain Factors in Development of Neurosyphilitic Lesions in Late Congenital Syphilis. Jour. Am. Med. Assn., 1923, *81*, 523). This article, which gives no references, states that "Kahan believes that the long standing character of the lesions of the internal secretory glands found in necropsies in cases of juvenile general paralysis seems to show that the syphilitic virus begins by first attacking the endocrine glands"; that "Stern, quoted by Pende, reports constant sclerosis of the thyreoid in tabetic patients," while "Dr. W. H. Brown has informed me that extirpation of the thyreoid has a definite effect on the rapidity of development of primary and secondary lesions in rabbits, one of which showed evidence of what might be termed involvement of the nervous system"; and that Peritz and others have mentioned the frequency with which infantilism is combined with juvenile tabes. One of us has called

Without being able to estimate either its value or its bearing upon the present discussion, we may remark the recent investigation of Rosen,[148] who reports that low values for blood cholesterol (as determined by a method which he regards as the most reliable yet devised) were present in 100 per cent of patients with untreated primary syphilis, in 50 per cent of patients with untreated secondary syphilis, and in 25 per cent of patients with untreated tertiary syphilis. Rosen also reports that after treatment all the primary cases showed a rise to normal or more than normal values, whereas the cholesterol content of the blood remained low after treatment in some of the secondary and tertiary cases. It would be interesting to have further details as to these latter cases and their subsequent course—to know whether, in the light of the hypercholesterolemia of pregnancy and the favorable influence of pregnancy upon syphilitic infection, there is any relationship between this failure to reach a normal level of blood cholesterol, even after treatment, and the type of response to the infection manifested by those patients who exhibited this failure.

There are, then, apparently racial differences and certainly a sex difference in the occurrence of parenchymatous neurosyphilis. With regard to the former, there is perhaps some reason for believing that a long period of syphilization is a prerequisite for the

attention to the apparently frequent association of an arrest or retardation of general development with juvenile paresis (Bunker, H.A., Jr.: Juvenile Paresis: its Salient Characteristics, with Special Reference to Infantilism. Am. Jour. Syph., 1926, *10*, 553), mentioning that this condition of delayed bodily development was one of the features of the original case reported by Clouston in 1877, and was present in all three of Alzheimer's own cases and in 11 of the 38 cases collected from the literature by him in 1896, and in all seven of Klieneberger's series published in 1908; of Schmidt-Kraepelin's 40 patients, 17 were of normal stature but only five were of a normal degree of general physical development. This general arrest of development seems, so far as can be judged, to have been in many cases an underdevelopment characterized by the conservation of the relative adult proportions of the body, the arrest of growth being as it were symmetrical and uniform, and not specific to any particular structures—the so-called Lorain type of infantilism, whose subjects appear to be, in the apt metaphor of Brissaud, "vus par le gros bout de la lorgnette"! Nevertheless, it is a question whether this and allied conditions are not as frequent in congenital syphilitics without nervous system involvement as in the subjects of juvenile paresis and juvenile tabes, and are thus in no way especially characteristic of neurosyphilis of the congenital type, the more so since probably two-thirds of all juvenile paretics do not manifest a syndrome of this kind. (See further: Hutinel, V.: *Le terrain hérédo-syphilitique*. Masson et Cie., Paris, 1926; pp. 271-373, and especially pp. 357-359).

[148] Rosen, I., and Krasnow, F.: Blood Cholesterol Findings in Syphilis and in Other Skin Diseases. Arch. Dermat. and Syph., 1926, *13*, 506.

eventual appearance of nervous system disease in a given people; the alleged absence of involvement of the cerebrospinal axis among the natives of Bechuanaland, to whom syphilis was first imported some fifty years ago, and the probable lower incidence of parenchymatous neurosyphilis in the negroes of this country, among whom syphilis has been present for less than three hundred years, possibly point in this direction. To what extent this signifies the development in a race long syphilized of a relatively increased immunity to syphilis, with a consequent attenuation of the immediate tissue response to the infection and the resulting exposure to subsequent attack of organ systems which would otherwise have received protection from a more adequate early tissue reaction, must remain quite uncertain, since such a conclusion rests on assumptions experimentally supported but not indubitable.

It is clear that parenchymatous neurosyphilis exhibits a definite difference in its incidence in the two sexes, not in the sense that such conditions as hemophilia and color-blindness, manic-depressive psychosis and Korsakoff's psychosis, do so, but in a less fundamental and as it were intrinsic sense; for it appears that (*a*) congenital neurosyphilis (juvenile paresis and juvenile tabes) occurs as frequently in females as in males, (*b*) invasion of the central nervous system during the first year of the infection takes place with the same frequency in women as in men, and (*c*) nulliparous women with late syphilis exhibit the same incidence of spinal fluid abnormality as is observed in men, whereas on the other hand (*d*) this incidence is only half as great among women with late syphilis who have had one or more pregnancies subsequent to contracting the disease as it is among nulliparæ and in men. It is likewise fairly well established that pregnancy, when infection coincides more or less with conception, effects a suppression of the early manifestations of syphilis or a considerable delay in their appearance; and it is also certain that the incidence of "latency" is appreciably higher in syphilitic women than in syphilitic men. Hence, one of the most important factors in the sex difference observed in both clinical and asymptomatic late neurosyphilis appears to be a factor introduced by pregnancy; but its precise nature and its *modus operandi* are obscure. We know that pregnancy is characterized by an increased titre of cholesterol in the blood and at the same time by increased deposits of cholesterol and cholesterol esters

in the cortex of the adrenal gland, together with a permanent hyperplasia and hypertrophy of the glomerular layer of the cortex in which these deposits chiefly take place, somewhat analogous to the hypertrophy of the *pars anterior* of the pituitary body which pregnancy also induces. And we know, on the one hand, that the adrenal cortex is concerned in some (probably indirect) way with the defense of the organism against bacterial toxins, as indeed pregnancy confers a certain degree of protection against infections; and on the other, that (experimentally) the state of pregnancy—or perhaps rather the phenomena involved in the œstrous cycle—is capable of neutralizing for a time the effects of adrenal cortical insufficiency, in materially prolonging the period of survival of adrenalectomized animals. Furthermore, it has been alleged that untreated early syphilitics exhibit uniformly a reduction in the cholesterol content of the blood; if this be so, it might be important to investigate further that small proportion of patients who, it is also asserted, fail to regain a normal cholesterol content of the blood after antisyphilitic treatment. Finally, it has been shown that in experimental rabbit syphilis various endocrine organs—in particular, the thyreoid, the parathyreoids and the thymus—become involved in association with the infection, entirely apart from the occurrence in them of localized syphilitic lesions; and that this involvement, in the sense of a permanent hyperplasia suggestive of a higher plane of functional activity, appears to run parallel, in its character and degree, to the resistance displayed by the groups of animals investigated. This observation, the authors of these experiments believe, points to the possible part which the endocrine organs may play in the matter of resistance and of constitutional predisposition; they suggest, indeed, that differences in individual susceptibility as regards syphilis, and even racial peculiarities of the disease (as well as the differences between pregnant and non-pregnant women), may be explainable on this basis.

If the foregoing data include, as we hope, the major part of that which is known or presumed concerning race and the individual in relation to general paralysis, we are led to a further consideration of the "soil" as representing one of the more fundamental factors in the genesis of neurosyphilis.

(TO BE CONCLUDED)

Notes and Comment.

PSYCHIATRIC RESEARCH.—Our prophets of eld, who saw in the approximations of early biology the keys of human individuality, have disappointed us. Heredity must grow for a long time yet, ere its flowers of scientific truth can decorate our studies. The later prophets of biochemistry have left also the bitter-sweet of disappointed hopes. Their physics and chemistry which were to be simple data for resolving our "poorly formulated" problems have grown apace, so that physicists and chemical theorists now ponder, as we ponder, in fields almost equally perplexing. The science of colloids and the science of biology are related, indeed; but the one is not the "explanation" of the other, nor a suitable point of departure for rhetorical self-deception as to mental function and maladaptation.

A person is an organism-environment complex which may be viewed from many a standpoint, but can be understood only after much more data as to the factors significant in this complex shall have been brought to light. The time for speculation with terms such as trophism, reflex, instinct, imitation, habit, affect, symptom-formation and the like, is passing. We begin a serious reobservation of the data of infancy with such work on the neuro-physiological side as that of Tilney and Casamajor and of Minkowski; on the behavior side as that of Margaret Grey Blanton and of Gesell. Elsewhere in this issue we publish a study by Levy which contributes much to the solid ground for the theory of oral components in infantile personality.

The National Research Council has established a Committee on Child Development and the Laura Spelman Rockefeller Memorial has granted them funds for a number of scholarships and fellowships in child development. This is particularly gratifying as an evidence of awakening interest in psychiatric and related matters on the part of the Rockefeller group of philanthropies. The Commonwealth Fund, which has given most liberal financial support to the Child Guidance Clinic movement in its program for prevention of delinquency, has just made an award which permits the

creation of three-year fellowships in psychiatry at the Phipps Psychiatric Clinic of the Johns Hopkins Hospital (see page 1079).

Medical sciences in general have secured liberal financial backing for research. The latest announcement is a grant of $250,000 by Jeremiah Milbank of New York to the International Committee for the study of infantile paralysis. Excepting for the two grants above mentioned, and $42,500 secured by the Social Science Research Council for juvenile and behavior research, philanthropic groups seem but very feebly interested in the study of mental disorders. Juvenile delinquency perhaps impresses them the more from the dubious success of the juvenile court systems. But the vast economic burden resulting from grave mental disorder, and the incalculable but colossal impedance of human success and contentment immediately due to maladjustments of all degrees seem still to be outside their consciousness.

Fundamental psychiatric research is almost entirely neglected. As a result, some of the more specialized work suffers now as psychotherapy generally, suffers. There is no real basis of carefully determined facts from which to derive its practice and its future ramifications. There is good reason for such pessimism as that of Dr. Healy, pioneer in juvenile delinquency research.

The American Psychiatric Association is logically and in reality the organization concerned in research into fundamentals of human nature and vicissitudes of personality, from which all sound and consistent remedial work will derive. Its integration, however, is a brief annual phenomenon. Its members are pre-occupied with their multifarious duties for which so few of them have full facilities.

It should vigorously and in a sustained fashion (1) seek funds for these necessary investigations, (2) analyze available personnel and materiel for research, and (3) further approved projects. To accomplish anything of this order, it requires, in addition to its regular organization, a permanent secretariat including a scientist of broad training not only in the governance of research projects but in creating interest among philanthropic organizations in the support of our projects. With him there should be frequent meetings of a small, active, capable and far-sighted advisory committee on psychiatric research, this latter both to coordinate and consider and *to originate* projects, assemble and encourage personnel, and facilitate the dissemination of results when any are available. Such

an organization might well work with our Executive Committee, with powers to receive and disburse research funds, reporting to each annual meeting.

H. S. S.

Politics in State Hospital Systems.—There comes to our attention a regrettable foreboding of petty political juggling in the care of mental patients in some of our states. It is sad indeed to contemplate in this day of public health and community welfare, when for example the State of New York is erecting an institute for psychiatric research at a cost of nearly two millions of dollars, that politicians in some few states are so unconscious of their responsibility, not only for care of the mentally sick but to the common welfare, that they will consider disturbing state hospital staffs for reason of petty politics only. It is to our serious discredit that we have been so backward in coordinating our knowledge and in instructing the public, that we must fear indifference on the part of influential citizens and leaders of public opinion. Only in such a setting will small men dare to displace competent psychiatrists to make jobs for untrained henchmen. Only in such a setting do uninformed enthusiasts for reform destroy what little we are accomplishing without realizing the magnitude of the problems with which they are tinkering, and their need for most expert advice before casting off the old for the untried.

H. S. S.

Important Announcement About Round-Trip Rates.

Members are requested to follow very carefully the new instructions concerning round-trip rates, which will be mailed to them with the complete program, about the middle of May. Negotiations are almost completed by which a round-trip ticket may be obtained at the starting point for a fare and three-fifths, with a 30-day limit. If these negotiations are successful, identification certificates will be enclosed in the program. No other arrangements should be made.

The Hotel Radisson still has a number of rooms for our members.

Doctor W. J. Mayo will give an address of welcome to the Association at Minneapolis. If any of the members can visit Rochester, both the Mayo Clinic and Doctor Kilbourne of the Rochester State Hospital will welcome them there.

Association and Hospital Notes and News.

List of Applicants for Fellowship or Membership of The American Psychiatric Association, 1928:

Forrest Nelson Anderson, M. D., Pennsylvania Hospital, Philadelphia, Pa.

Ludolf Nicholas Bollmeier, M. D., Hall-Brooke Sanitarium, Green's Farms, Conn.

Leo Melville Crafts, M. D., Minneapolis, Minn.

Florence M. Crimmins, M. D., Pennsylvania Hospital, Philadelphia, Pa.

Henry Jackson Hayes, M. D., Memphis, Tenn.

Walter Jackson Freeman, M. D., Washington, D. C.

Ives Hendrick, M. D., Sheppard and Enoch Pratt Hospital, Baltimore, Md.

H. Beckett Lang, M. D., Willard State Hospital, Willard, N. Y.

Otho R. Lynch, M. D., U. S. Veterans Hospital, Northport, N. Y.

Minna Mary Rohn, M. D., Willard State Hospital, Willard, N. Y.

Walter E. Scribner, M. D., Binghamton State Hospital, Binghamton, N. Y.

Walter R. Van Tassel, M. D., Binghamton State Hospital, Binghamton, N. Y.

Dr. Beemer Retires.—After 50 years of service in the Ontario Hospital at Mimico, Dr. N. H. Beemer retired from the post of superintendent on March 15, last. We join his many friends in and out of the profession in extending congratulations to Dr. Beemer on this occasion and hope that he will find in his greater leisure from administrative burdens the opportunity for still greater services to the cause to which he has so unselfishly devoted himself.

American Sociological Society Cooperation.—A committee, consisting of Professor W. I. Thomas of the New School for Social Research, chairman, Professor R. E. Park of the University of Chicago, and Professor Kimball Young of the University of Minnesota, has been appointed by the American Sociological Society to cooperate with the Committee in Social Science Relations of The American Psychiatric Association. A session at the next annual meeting of the Sociological Society will be devoted to psychiatry and its relationship to social problems.

FELLOWSHIPS IN PSYCHIATRY AT THE HENRY PHIPPS PSYCHIATRIC CLINIC.—"Through the generosity of the Commonwealth Fund, an opportunity has been created for a number of three-year fellowships in psychiatry to promote the thorough training for active work and leadership in the type of psychiatric practice and research most needed by our American communities.

"The first condition in the selection of candidates is that the applicants should have tried out their natural bent and capacity for the understanding and management of personality problems of adults and of children and that they be determined to acquire the training the present status of psychiatry demands and puts at one's disposal.

"The holders of these fellowships are to be on the same footing and with the same responsibilities as the members of the house staff of the Henry Phipps Psychiatric Clinic of the Johns Hopkins Hospital and University. The assignments will cover practical work with house and dispensary patients, work in the laboratories (psychobiology, neurology and internal medicine), familiarization with the literature and research problems and methods, and the further development of special talents and interests in field work with schools and in other directions.

"Arrangements are planned to offer living accommodations close to the clinic so as to facilitate the ease of working together.

"The financial provisions (ranging from $1800 to $4000 a year) will be adjusted according to the individual needs to cover a three-year program. These fellowships are not likely to be sufficient for the support of entire families or for the accumulation of savings, but aim to provide an equipment for individual work and for subsequent competition for positions in the psychiatric field that should bring adequate compensation and opportunities for a career after three years' service.

"The qualifications required are evidence of talent for actual service to patients, and adequate fundamental medical and, if possible, pediatric training and interest, and also sufficient determination to make use of the literature (if possible with a working knowledge of German and French). Above all things there must be evidence of spontaneity and energy in work and capacity for independent investigation and presentation of results.

"As far as possible, the incumbents of the fellowships will be helped to work ultimately without dependence on an elaborate organization. The utmost stress is put on the study, formulation and management of specific cases and problems. Incidentally a reasonably systematic mastery of the available data and methods in personality study, and in psychobiological, neurological and somatic fundamentals and in the working up of groups of cases and topics of investigation is aimed at, by means of assignments of time and facilities for special work and conjoint reports and discussions.

"What appears to be the most pressing need in the psychiatric field is ability to get at the facts needed for comprehensive, concrete and pointed formulations for purpose of practical applications. Training in summary as well as more detailed work, and a balanced judgment as to what can be expected and attained are aimed at. Without continuity in systematic training and freedom from distraction in doing the work well, relatively too few cases and tasks are likely to be carried through to a point where all the data and inferences serving for general guidance are sufficiently tested and retested. With proper apportioning of time and work, and ways of mutual demonstration and discussion of the results, three years without the pressure of uncontrollable demands and competition should assure the habits of work and attainments so greatly needed in this most responsible field of guidance of man."

Letters of application should be addressed to Adolf Meyer, M. D., Johns Hopkins Hospital, Baltimore, Md.

INTERNATIONAL NEUROLOGICAL CONGRESS.—The Council of the American Neurological Association is proposing an International Neurological Congress to be held late in August or early in September of 1931. Their committee under the chairmanship of B. Sachs, M. D., desires expression of opinion from local neuropsychiatric associations, in regard to program and other details. Dr. Henry Alsop Riley, 870 Madison Avenue, New York City, is secretary.

THE ASSOCIATION FOR RESEARCH IN NERVOUS AND MENTAL DISEASES has decided upon the following program:

1929, "The Convulsive States," Stanley Cobb, Chairman; and "Further Studies in Schizophrenia," George H. Kirby, Chairman.

1930, "Manic-Depressive Psychosis," William A. White, Chairman.

NEW METROPOLITAN HOSPITAL FOR BOSTON.—Work is under way on the one and one-half million dollar hospital being erected to provide additional facilities for the mentally ill of Boston and environs. We understand that this hospital is the first to be built in accordance with the carefully ascertained individual needs of patients and of the community. Wherever possible, plans for standardized units are being used, and the capacities are so adjusted that cases holding reasonable expectancy of improvement or recovery will remain in the acute group until their release from the hospital, with as little contact with the continued treatment group as possible.

MATHESON SURVEY OF EPIDEMIC ENCEPHALITIS.—The foundation established for the study of nervous diseases through the generosity of Dr. Wm. J. Matheson, is interested in the occurrence of "a group of cases [of epidemic encephalitis] in any locality. It is the object of the committee to send a trained epidemiologist to the field to cooperate with the local physicians in studying the source of infection and possible modes of communication. Should any such situation come to your knowledge, will you kindly communicate with Dr. Josephine Neal, at the Academy of Medicine, 2 East 103d St., New York City."

ASSOCIATION FOR STUDY OF THE FEEBLE-MINDED.—Fifty-second annual meeting is to be held at Haddon Hall, Atlantic City, N. J., on May 31, June 1 and 2, 1928.

Abstracts and Extracts.

SANDS, J. IRVING: *Manifestations of Mental Disorders in Travelers' Aid Society Clients.* (Mental Hygiene, II, 728, October, 1927.)

An interesting review of a variety of type cases encountered in his work with clients of the Travelers' Aid Society in New York. The case histories are well presented and the varieties include: (1) The hysterical reaction type. (2) Post-epidemic encephalitic reactions. (3) A group of children of normal or superior intelligence attempting to escape from unfavorable home environment. (4) A group of adolescent sex problems. (5) A group of feeble-minded, between the ages of 18 and 25. (6) A group of foreign girls who come to this country in the hope of marrying men with whom they have been corresponding. (7) Psychotic cases, including manic-depressive psychoses, dementia præcox, paranoia, cerebral arteriosclerosis and senile psychotic conditions. (8) Clients, sound of mind but physically ill, requiring social adjustment because they are accidentally stranded away from home.

The general plan of handling these cases appears from the article to be: (1) Psychoneurotic conditions, escape problems, mental defections, and the foreign girls are generally returned to their homes where the local Travelers' Aid Society assists in readjustment. (2) The other cases are handled on a more individual basis and necessary occupational adjustment, hospitalization, etc., is secured for them.

EBAUGH.

RICHARDS, ESTHER LORING: *Formulating the Problem of Social Case Work with Children.* (Mental Hygiene, II, 688, October, 1927.)

Social case work presents a variety of problems which calls for specialization of the social worker along varied lines. She feels that social case work has a common language of methods of investigation and principles of treatment which is not being thoroughly utilized because technicalities of specialization are obscuring fundamental issues. The principal difficulty has been the historic development of social science along the lines of economic theories and academic classifications, whereas the actual field work has brought about the necessity of studying the individual and his social adjustment. The necessary steps are the reconstruction of the setting of particular difficulty in terms of the life story of the individual in all of its various aspects. These facts must be arranged in an orderly and systematic form. The next step is to formulate the social problem involved in the story obtained. It is this point that is the weakest in social case work because the tendency has been to move along general lines, which are more

or less hard and fast, in place of considering the individual situation. She thinks that in such failures to differentiate between individual needs and general principles of social treatment it is the child who suffers most. The treatment is planned for behavior problems in general instead of for individual children in particular. Many case records lack the essential details that would enable one to formulate accurately the make-up of the individual, the environmental setting, the real social problem involved or what steps might be best taken to modify any of these. The placement of dependent children cannot follow any hard and fast lines, such as placement in a foster home rather than in an institution. The most important factors here appear to be the individuality of the child and uncertainty regarding the environment into which we send him. She quotes several instances from case records to show that even where the economic and physical hygienic surroundings are satisfactory, the emotional environment may be such as to be positively harmful to the best interests of the child. Other important factors she considers to be the limitations imposed by the inelastic attitudes of the judiciary and economic straits which do not give the social agency a chance really to do a good piece of work. She believes that social case work has made real progress and that all of the different organizations involved have identical goals. She considers the ideals for realization to be too high for the splitting of hairs over trivialities or bickering over details of specialization in treatment or hastily becoming attached to some one point of view.

EBAUGH.

MYRICK, HELEN A.: *Psychiatric Social Work and the College Student; A Forecast.* (Mental Hygiene, II, 723, October, 1927.)

The general functions of the psychiatric social worker as they might be carried out in a college are: (1) Case work with the student, including both gathering the history of his behavior and assisting in social adjustment. (2) Organization of social resources to help the student in social adjustment. (3) Training of student advisers in the technique of applying mental hygiene. (4) Liaison between the student, the psychiatrist and extra-curricular officials and activities. (5) Prevocational education and advice in relation to the fields of mental hygiene. (6) Research in the sociological and technical phases of psychiatric social work.

The author considers that mental hygiene in the colleges cannot obtain its ultimate degree of success without the social worker and deplores the general tendency to ignore this phase in mental hygiene experiments in the colleges.

EBAUGH.

SYZ, HANS C.: *On a Social Approach to Neurotic Conditions.* (The Jour. of Nervous and Mental Disease, 66, 601, December, 1927.)

This author states that in previous approaches to a consideration of mental disturbances, the cause has been thought of as localized specifically within the individual patient. He calls attention to the new position advanced

by Burrow in his recent writings wherein he has emphasized the need to view the individual disturbance in its larger social settings. The author considers Burrow's investigations to make evident that the formulations, the codes and the type of interaction postulated by and characteristic of the social environment generally enter as determining factors in every manifestation and reaction of the individual personality. The author would compare this viewpoint with that of public hygiene in respect to physical disease. He states that the influences of environment may even go so far as to become the determining element in the development of specific organic features and quotes experiments of others to illustrate this point. He considers social organization as being a form of integration and hence must be viewed in its integrated aspects. This is particularly true in the psychic sphere. He quotes Wheeler to show that the result of intensive socialization does not always lead to progressive changes but at times to rather degenerative individual features and cites examples from animal life. "In the human individual, too, reactions and characteristics cannot be regarded as detached and independent manifestations. The single individual being a determining interactive element of a larger social organization, is at the same time a function of this interaction and of the socially formulated codes and institutions that surround him." He considers the division posited between the social background and the individual to be artificial and evasive of the full import of the individual's social involvement. "We lose sight of the fact that each of us is environment as well as the individual who is supposed to adjust to the environment. Not only is this true of the patient but also of the observer. He thinks there is an overwhelming resistance on the part of the individual to accept the circumstance of his social dependence, or if this is accepted theoretically by him, he does not admit it as a feeling conviction that his emotional reactions are a reflection of a socially induced and accepted and unrecognized self-deceptions; if he too cannot distinguish between what he actually does and what he presumes he is doing, how can we expect him to visualize and evaluate clearly in the patient incongruities and delusions that are identical with his own." He believes this social situation calls for a specific technique of investigation. The procedure must be adapted to the social level of organization. He considers that the group approach, as worked out by Burrow, tends to meet definitely some of these problems. Two points deserve special consideration: (a) Both the individual observed and the investigator himself express social influences with their prejudices, etc.; and (b) the socially dependent nature of the symptom which appears in the specific case needs to be recognized. He states that the group situation offers opportunity for recognition and inclusion of the personal factor. The group technique must be an analytic approach and must recognize those mechanisms which psychoanalysis and psychiatry are concerned with, but does not have to employ any analytical theories of libido, regression, complexes, etc.

EBAUGH.

LYDAY, JUNE F.: *The Place of the Mobile Clinic in a Rural Community.* (Mental Hygiene, XII, 77, 1928.)

Calls attention to the rapid spread of psychological and psychiatric services to the smaller communities. She describes in detail the organization and mode of operating of the mobile clinic of the Iowa State Psychopathic Hospital, which is somewhat different than anything attempted in other places. A psychiatrist, a psychologist, two psychiatric social workers and a secretary make up the field unit. This unit visits a community after a careful study has been made as to the advisability of doing so. It remains in one county from 5 to 10 weeks, examining about 20 cases a week. A period of six weeks in the community and two weeks at the hospital to write reports has proved a satisfactory distribution of time. Nine such communities have been visited. One month in the summer is spent at the hospital in study with the special research group and one summer month is taken for vacations. More requests for examinations are received than can be accepted and the cases selected are roughly apportioned between the various towns of the county. Clinic headquarters are established wherever convenient. School children are seen at the schools—other cases at the headquarters. One thousand one hundred six cases had been examined at the time of this report. About one-third were females and two-thirds males. Sources from which they were referred were: Schools, 707; state orphanages, 198; relatives, 74; social agencies, 57; doctors, 26; courts, 10; school nurse, 6; self, 11; at the clinic's request, 17. The problems encountered were similar to those in almost any clinic. Studies of teaching methods were found to be of importance. In addition to the field work the unit cooperates with the special research unit at the hospital in the study of cerebral physiology, especial emphasis being placed on reading disabilities. The author concludes that this type of clinic is of great value to the communities served and has excellent possibilities of meeting the demands of rural sections.

EBAUGH.

WILTY, PAUL A., and NELSON, H. N.: *The Ungraded Room in Kansas.* (Mental Hygiene, 1928, XII, 72.)

Questionnaires sent to superintendents of schools in 84 first and second class cities in Kansas. Sixty-five replies were received. Analysis disclosed several interesting facts. Total number of students reported in ungraded classes was 416—272 boys and 144 girls. Several first class cities in Kansas had no classes of this kind. The discrepancy between incidence of boys and girls is interpreted by the authors to mean that girls are not being detected as frequently as boys. They calculate that less than 6 per cent of the feeble-minded in Kansas are in such classes. The method of selection is based upon the I. Q., retardation, or the recommendation of the teacher, or all three together. Intelligence tests have by far the greater emphasis. A few opportunity, restoration or disciplinary cases are sent to these classes. Range of intelligence quotient in the classes is from 30 to 70 with the mean of 66. Eighty-five per cent of the time in these groups is devoted to academic

studies. The authors consider this far too much and quote Wallin and Goddard to support their view. In general the teachers were fairly well prepared in psychology but most of them lack special training along the desired lines. The authors also gave the Stanford Achievement Test Form A to ungraded pupils in certain cities. They found that the mean chronological age of the groups was 12 years, 6 months; the mean mental age 8 years, 1 month; and the mean educational age 8 years, 3 months. The range of chronological age covered 16 years. A general inferiority in academic attainment appeared to be the chief characteristic of the group. They offer no recommendations.

EBAUGH.

SMITH, SIDNEY KINNEAR: *Psychiatry and University Men.* (Mental Hygiene, 1928, XII, 38.)

Reviews 300 cases on the psychiatric service of the University of California. These cases are made up of those students of the university who have been under treatment for various problems. The author calls attention to the spread of psychiatric service in colleges and universities and recommends that such service be conducted in association with the student-health work of the university (a logical and wise recommendation). The majority, 198 of the 300 students, were referred from the general dispensary. The rest were referred from the infirmary wards, the president's office, the dean of men and other deans, the heads of departments and the police. Fifty-one cases came voluntarily to the clinic. The growth of the service is shown by attendance by years. In 1924 there were 68 patients; in 1925 there were 98; in 1926 there were 126. As to distribution by years it is of interest that most of the cases come from the sophomore and freshman groups. The types of problems presented were as follows: Maladjustment (not diagnosable as psychosis or psychoneurosis), 84 cases; sex problems, 58 cases; hysteria, 15 cases; neurasthenia, 21 cases; psychasthenia, 12 cases; anxiety neurosis, 5 cases; traumatic psychoneurosis, 11 cases; intellectual inferiority, 11 cases; psychopathic personality, 10 cases; disorder of ductless gland, 15 cases; neurological disorder, 24 cases (including 10 cases of epilepsy, 1 of brain tumor, 2 of multiple sclerosis, 1 of progressive muscular atrophy, 1 of Friedreich's ataxia, 2 of peripheral neuritis, 4 of migraine, and 3 of encephalitis); psychosis, 24 (not analyzed); and unclassified, 10 cases. The principal causes of maladjustment, the author finds, rests in the need of the student, coming from a smaller school, to adjust to the university life. Fraternities would seem to be a help to the student for of the 300 cases only 61 were fraternity men while the student body is made up almost equally of fraternity and non-fraternity men. The problems are solved on the individual basis, the general aim being to increase social contacts, extra-curricular activities, etc., and give definition to the student's aim and ambitions in life. The sex problems, according to the author are those of masturbation and homosexuality. Sexual re-education is attempted. As to homosexuals, "At one time in our university history such students, when found out, were im-

mediately dropped," now, "Occasionally, but not often, dismissal must be recommended." The other problems are treated according to their needs in a like manner. The greatest degree of improvement, he finds, has been obtained in the maladjustment and the sex cases. He concludes with recommendations for the organization of a mental hygiene department in universities in connection with the student-health agency and outlines a fairly adequate scheme.

EBAUGH.

PARSONS, HERBERT C.: *The Learned Judge and the Mental Defective Meet—What Then?* (Mental Hygiene, 1928, XII, 25.)

Discusses the present trend in judicial procedures toward a liberalizing of the attitude and disposition of cases which imply a partial responsibility or a specialized mode of treatment. The dramatic style does not permit of adequate summary. The following ideas are outstanding: (1) There is a vast difference between the mentality of the judge and the average offender. (2) The probation officer and the court psychiatrist are adjuncts to the court to be used at the discretion of the judge in the attempt to protect society from the criminal. (3) The judge to-day is becoming more and more liberalized in his attitude and is being given greater leeway in the final disposition of cases. (4) To meet the demand created by this liberalization such new institutions as those for defective delinquents, reformatory institutions, etc., are being created. He calls attention to the developments in the Massachusetts code from 1911 on and concludes that these changes in legal procedure are developed by the people as they recognize the necessity for them and are not brought about at the request of the courts. Moreover, he contends that the administration of justice must be kept in the hands of the courts and that parole officers, psychiatrists, etc., must remain in the rôle of advisors, to be followed or not at the court's discretion.

EBAUGH.

ANDERSON, V. V.: *A Psychiatric Guide for Employment.* (The Personnel Journal, 1928, VI, 417.)

Outlines a clinical approach to the selection and maintaining of personnel. He emphasizes the importance of a detailed knowledge of the job and proceeds to outline the clinical method of interviewing the prospective employee. This calls for: (A) A personal history, including developmental, health, educational and work histories. (B) A personality study including observations on the intellectual activities, motor characteristics, temperament, self-expression and sociability of the applicant. (C) A study of home problems. He outlines a conventional psychiatric approach and gives suggestions for eliciting and recording the necessary information. There are also suggestions for reading, and various types of personalities that might be poor industrial risks are described. The use of psychological tests in the evaluating of the intelligence and special abilities is approved as an adjunct to the interview. The author stresses the necessity for follow-up on all employees interviewed

in order to improve the technique of selection and to aid in the critical period of adjustment to the new working conditions. The paper is very interesting and worthy of reading as it presents an adaptation of common psychiatric practice to the needs of industry.

EBAUGH.

POLLOCK, HORATIO M.: *State Institution Population Still Increasing.* (Mental Hygiene, 1928, XII, 103.)

Compares the results of the 1923 census with the 1927 census of state hospitals for mental disease, state institutions for the feeble-minded, and state prisons and reformatories. An increase in rate of patients per 100,000 population occurred in all of the 30 states from which complete returns were made, except Ohio, Michigan, Oregon and California. A decline in rate also occurred in the District of Columbia. In the 30 states there was an increase of first admissions from 46.8 per 100,000 to 47.3. Increases are found in rates of first admissions in 16 states, decreases in 13 states and the District of Columbia. There is a wide variation in the individual states, not fully accountable. The number of feeble-minded and epileptics in institutions in 36 states has increased from 47.0 per 100,000 population to 54.7. There was an increase in each of the states listed. The rate of first admissions was very slightly increased—7.4 per 100,000 to 7.6. The rate of first admissions, the author states, would probably be greater if institutions were available. Inmates of prisons and reformatories of 31 states giving complete returns show an increase per 100,000 from 66.6 to 84.1. The author attributes this gain to more rigid law enforcement and greater severity of sentence.

EBAUGH.

MYERS, GARRY CLEVELAND: *School Room Hazards to the Mental Health of Children.* (Mental Hygiene, 1928, XII, 18.)

This writer states that the competition among educators for speed in class work is building up a number of hazards to the mental health of school children. The necessity for speed imposed upon school teachers by their superiors is reflected in the school room as praise for the speedy and impatience for the slower students, without enough regard for the quality of the work. This works to the detriment of the slower students who most need careful training. This difficulty is increased by the tendency of the curriculum experts to crowd new activities into the already overcrowded time of the school child. He notes with approval the recent development of self-teaching texts in which the student is allowed to proceed at his own pace and the tendency in some schools to reduce the number of specific facts the child is supposed to learn in a given time. He makes the following suggestions for educators: (1) First recognize that the most effective learning presupposes a comfortable learner. (2) Let the educational testers call a halt to their testing program. (3) Remove all speed suggestions from the school room. Substitute accuracy and calm for carelessness and haste. (4) Let supervisory schemes be simplified. (5) Let more be done to relieve the teacher of unnec-

essary work and encourage her to introduce more human touches into her teaching. (6) Let those responsible for the curriculum lessen the number of specific facts and skills which the average child is supposed to master in a given time. (7) Let educational experts and school officials confer more frequently with parents to discover how they feel about the curriculum and methods of the modern school. (8) To the school psychologist add the school neuropsychiatrist who will check up on the mental health of school children and teachers and advise the school authorities as to methods and curricula in terms of mental hygiene.

EBAUGH.

FOX, EDNA J.: *An Investigation of the Effect of Glandular Therapy on the Intelligence Quotient.* (Mental Hygiene, 1928, XII, 90.)

Presents a study of the effect on the I. Q., of treatment of glandular disturbances by glandular therapy. The group in which the mental tests were repeated consisted of only 22 cases but there was no appreciable change in the average I. Q. for the group (1.5 points average). The maximum gain was 11 points. Losses occurred in some cases. She finds a correlation between glandular disfunction and I. Q., as the average I. Q. in the glandular group (182 cases) was 74 while in the unselected clinical group (1867 cases including the above group) the average I. Q. was 78. The lowest correlation appeared to be with hyperthyroidism, the highest with hyperpituitarism. Pluriglandular cases made the greatest gain in I. Q. under treatment.

EBAUGH.

TILBOORG, GREGORY: *Malignant Psychoses Related to Childbirth.* (The Am. J. of Obst. & Gyn., 1928, XV, 145.)

Defines the term puerperal psychosis as "merely a mental disorder which develops in relation to and usually following childbirth." He restricts his discussion in this paper to those cases that are not definitely organic or toxic. Reference is made to the numerous and varied attempts to explain these psychoses, especially those explanations based on consideration of the strain on the cardio-nephritic and endocrine systems. The author would explain the incidence of these mental illnesses on the basis of psychic constitution "apparently the psychic resistance of such women is too low to withstand the impact of childbirth in all its stages." Therefore he examines the past history for signs of low psychic resistance. Statistics of incidence of puerperal psychoses range from 3 to 8.7 per cent of the total incidence of mental diseases. As to the phase of gestation and parturition in which these mental illnesses appear he states that 3 to 23 per cent occur during pregnancy, 6 to 45 per cent occur during lactation, whereas 40 to 86 per cent occur during the puerperium. He thinks that many cases occurring during lactation have an insidious inception during the puerperium and concludes that parturition is the most critical factor. Among these psychoses the malignant group constitutes 36 per cent to over 50 per cent according to various authors quoted. The author presents 4 cases illustrative of the malignant group. He calls

attention to the following features in the past history as being rather characteristic of the personality type developing malignant psychoses in connection with gestation. (1) There is a predominance of characteristics suggesting a schizoid make-up. (2) Sexual frigidity. (3) "We may note in passing that the antagonism against the husband, developing acutely or gradually, is a manifestation that can be invariably observed in every puerperal case." (4) There is a lack of desire for married life and for children. (5) Schizoid traits may be present in other members of the family and "alcohol and suicide in the family are not to be overlooked." (6) The development of the psychosis may be gradual, almost imperceptible, but the majority develop acutely. (7) There may be manifest lack of interest in the home and family with indifference or actual antagonism to the child. The author states that his four cases are typical and not exceptional. In view of the evident characteristics he feels that risks of childbearing to the mental health of a woman may be evaluated beforehand and suggests a method of study with this end in view. (The four cases presented are all typical schizophrenic psychoses. One would have to consider the pregnancy as merely a precipitating factor and could not feel certain that avoidance of childbearing would avoid the advent of a psychosis.)

EBAUGH.

BOWMAN, KARL M.: *Medical and Social Study of One Hundred Cases Referred by the Courts to the Boston Psychopathic Hospital.* (Mental Hygiene, 1928, XII, 55.)

Calls attention to provisions in the Massachusetts law whereby a judge may send persons indicted or charged with crime to a hospital for mental diseases where their mental condition will be studied and reported upon. He also mentions that the judges may secure reports of any patient who has been in the hospital. Hence "the courts of Greater Boston are constantly referring cases to the Boston Psychopathic Hospital for examination as to their mental condition." The crimes of which these persons are accused "range from vagrancy to murder." The present study deals with 100 cases referred to the Boston Psychopathic Hospital between September, 1921, and February, 1923. Of these, 80 were males and 20 were females. Twenty-eight cases were found to be insane and committable, 5 more were psychotic but not committable. There were 3 cases of psychoneurosis, 35 were considered psychopathic personalities, 9 were regarded as feeble-minded, 3 were epileptic. The hospital gave positive recommendations in 56 of the cases. These recommendations were: commitment in 28 cases; probation or suspended sentence in 8 cases; commitment to a reformatory in 3 cases; and special recommendations in 17 more cases. "In the remaining 44 cases it was felt that psychiatry had no special recommendation or contribution to make toward the settlement of the case beyond the positive characterization of the patient's personality and the denial of the presence of mental disease or defect." Stress is laid upon the value of social service investigations in arriving at conclusions. He mentions the difficulty encountered in connection with patients who are

normal on admission but claim an abnormal mental state at the time the alleged crime was committed. "In general, our tendency in such cases has been to state to the court whether or not such a claim on the part of the patient was consistent with the facts before us and in accord with our knowledge of mental disease and to feel that the final issue was one for the judge to decide." Eight mild cases of mental disease presented some difficulties as to recommendation. The procedure here is to lay before the courts the facts with statements as to prognosis and treatment. The feeble-minded groups present difficulties of diagnosis. The Fernald idea of complete study is used. Diagnosis of psychopathic personality presents similar difficulties. These latter, the author considers, present also difficulties in disposition. "It is undoubtedly true that punishment and fear of consequences are not as strong deterrents of crime as we might wish, yet, as far as the psychopaths are concerned, other methods of dealing with them would seem to bring no better results." The defect is usually pointed out, leniency is considered as undesirable in many cases, and in a few selected cases, the author states, parole or suspended sentence may be indicated "but the psychiatrist should be exceedingly cautious about making such recommendations." The conclusions reached by the author are: (1) Psychiatry has a definite contribution to make toward the understanding of crime and in the disposition of prisoners. (2) In most cases in this series, the diagnosis and recommendations appear to have been correct according to data obtained by a follow-up study 4 years later. In some cases where parole or suspended sentence was recommended the patient has gotten into further trouble. Even so, such advice may be considered justifiable in certain doubtful cases. Some cases have done well where the court completely disregarded the psychiatric advice. (3) There is an enormous duplication of effort by psychiatric clinics. Cases are presented to illustrate typical groups.

EBAUGH.

Book Reviews.

Anatomical, Phylogenetical and Clinical Studies on the Central Nervous System. By B. Brouwer, Professor of Clinical Neurology, University of Amsterdam. Lectures delivered on the Herter Foundation. Johns Hopkins University, 1926. I. Projection of the Retina in the Brain. II. Pathology of Sensibility. III. Significance of Phylogenetic Studies for the Neurologist. (*Baltimore: The Williams and Wilkins Company, 1927.*)

The material covered by these lectures of the famous Dutch neurologist is drawn not only from the investigations of the author alone but those of his equally well-known Dutch colleagues.

In the first lecture he deals with the projection of the retina in the brain. Based largely upon his ingenious experiments carried out with Zeeman in which different quadrants of the retina were exercised by delicate ophthalmological operations in rabbits and monkeys, he proves that there is a sharp localization in the external geniculate body of the different quadrants of the retina. The rabbit and monkey vary considerably because of the fact that in the former the eyes are placed so far laterally that the visual fields of the two eyes overlap very little, whereas, in the monkey the situation is quite the reverse, since only the outermost periphery of the visual fields are served by one eye alone. The result is that in the latter animal, a fact which must also be true in man, there are nearly as many uncrossed fibers as crossed ones represented in each external geniculate body, and only a small part exists for monocular vision. This is represented at the ventral border of the periphery of the external geniculate body. The upper half of the retina is sharply localized to the medial, the lower to the lateral half of this body. The macula has a pretty large projection between them, but it is a localized one. The upper quadrant of the macula borders on the upper part of the peripheral retina and the lower part of the macula on the lower periphery.

Lecture II is devoted to the "Pathology of Sensibility." Prof. Brouwer distinguishes between "vital" sensibility which consists of stimuli for pain, heat and cold and partly tactile sensibility, the first neuron of which ends in the posterior horn on the same side, crosses over and proceeds upwards in the antero-lateral part of the spinal cord. The other type he calls "gnostic" sensibility which avoids the gray matter after entering the cord and passes up in the posterior columns to the nuclei of Goll and Burdach. It enables us to recognize the shape and size of objects and to distinguish two points applied simultaneously. It also renders the function of stereognosis possible. In the cortex the "gnostic" sensibility is confined in its distribution to the postcentral convolution, whereas the "vital" sensibility must

have a large and diffuse projection in the brain cortex, since a great part of the latter can be destroyed without causing any defect in vital sensibility.

The gnostic sensibility conducted by the posterior columns is considered by many a higher form of sensibility, and appears phylogenetically only when we reach land vertebrates. Moreover it is small among amphibians, reptiles and birds, increasing in mammals to man in whom it is most developed. In the same way the posterior columns develop late in human fœtal life as well.

On the other hand, the vital sensibility becomes more and more finely organized as the scale ascends, so that one can hardly now speak of a higher and lower form of sensibility. The difference seems to be between the two, that the vital sensibility receives autonomic impulses and is thus associated with phenomena in the emotional life, while the gnostic sensibility is non-autonomic. Of course, the two constantly interact, and it is this interaction which enables us to form ideas of the outer world.

The remainder of the lecture is largely devoted to the laudation of lipoiodal in spinal cord tumor localization, which according to the author renders a "good deal of this knowledge superfluous." It must be added in the name of many who, though they have succeeded in acquiring much less of "this knowledge" than Prof. Brouwer, are much more reluctant to give up its application to the localization of level lesions in the spinal cord than he seems to be.

The third lecture attempts to prove the "Significance of Phylogenetic Studies for the Neurologist." Thus in some cases of cerebellar atrophy Brouwer found that the atrophy was confined to that part of the cerebellum characterized as neocerebellum by Edinger. He is of the opinion that cells and fibers functioning for much longer periods in the life of the animal kingdom must be chemically and physically different from those making up the newer parts, and that the difference in vulnerability depends on this. The author invokes this difference in vulnerability to explain the fact, for example that in such a disease as disseminated sclerosis in which theoretically any and every part of the central nervous system may become involved, certain quite definite areas of predilection still exist.

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Birth Injuries of the Central Nervous System. Part I—Cerebral Birth Injuries: By Frank R. Ford, Johns Hopkins Hospital. *Part II—Cord Birth Injuries:* By Bronson Crothers and Marian C. Putnam, Harvard Medical School; with a foreword by Adolf Meyer. Medicine Monographs XI. (*Baltimore: The Williams and Wilkins Company, 1927.*)

The collaborators in this little book have set themselves a task difficult enough to have caused hesitation on the part even of a polyhistorian, and, to their lasting credit, have accomplished it admirably. Somewhere among the files kept by the obstetrician, the pediatrician, the neurologist, the neurosurgeon and the neuropathologist those truths lay hidden which

they have brought to light and correlated. The astonishing result is that the vague uneasiness shared by most of us about the dangers to the brain of injuries sustained during the process of birth, may to some degree be dispelled by the impression on the part of the author of Part I that they are "rare rather than common." On the other hand the Boston contributors have arrayed an unassailable mountain of facts to prove that serious, frequently avoidable, injuries to the spinal cord are the result of the application of traction by the obstetrician with "unphysiological force upon the various structures of which the most fragile, the most elastic and the most important are the nervous system and its protecting membranes."

The first part of the book, by Ford, is based on a review of the literature as well as an analysis of the case records from the pediatrics, neurological, neurosurgical and pathological departments of the Johns Hopkins Hospital. The author concludes that a large percentage of babies dying at birth or within the first few weeks of life show intracranial hemorrhage at autopsy. "The overwhelming majority of babies who show definite clinical signs of intracranial hemorrhage die within a few days." Some few infants on the other hand who do not die of their intracranial hemorrhage are very apt to recover *completely* even from moderately large extravasations of blood. The large majority of factors, however, such as contracted or malformed pelves, rigid soft parts, precipitate or prolonged labor, abnormal presentation, etc., causing hemorrhage and other cerebral injuries, are for the most part beyond the power of the obstetrician to mend.

The congenital diplegias which made up 235 of the 280 cases in the infantile spastic palsy group in the pediatrics department can be shown with considerable conviction to be the result of various pathological processes occurring during intrauterine life, so that "the great mass of infantile palsies can no longer be lightly attributed to faulty obstetrical procedures." In the rarer cases of infantile hemiplegias and monoplegias, on the other hand, a history of abnormal labor is obtainable in about 70 per cent, the heads are usually normal in size, the intelligence comparatively unaffected and the necropsy findings consistent with the diagnosis of birth injury.

The responsibility for chronic hydrocephalus is again removed from the shoulders of midwifery. The author believes that in only six out of two hundred cases is it at all probable that the aqueduct of Sylvius may have been plugged by a blood clot or bits of necrotic brain tissue which became organized with a resulting progressive hydrocephalus. In the vast majority of cases where the extravasation of blood into the ventricular system or subarachnoid spaces of infants produces an increase in intracranial pressure, enlargement of the head, dilatation of the ventricles and a mild inflammatory process in the meninges, these symptoms are transient and disappear when the blood is absorbed.

As for epilepsy, there is no clinical or anatomical evidence to connect birth injury in any way with "essential" epilepsy. In the case of "secondary" epilepsy the situation is altered—out of 100 unselected cases of epilepsy, nine proved to be focal in character and of these three showed a

definite association of their convulsions with birth injuries. The author thus concludes that "it seems probable that approximately 2 or 3 per cent of all epilepsies are related to birth injuries."

"Imperfect mental development, or amentia, occurs in many different conditions, few of which are related in any way to abnormalities of labor. . . . . Only three types of mental defect have any possible relation to birth injury: the spastic, the hydrocephalic and the epileptic, all of which have already been discussed. There remains the remote possibility that some birth injuries might involve large areas of cortex without producing paralysis or epilepsy. Such cases must obviously be excessively rare."

The authors of the second part of the volume draw largely upon their own not inconsiderable experience with patients suffering from lesions of the spinal cord and brachial plexus. They feel that the presentation of this material may not only be helpful in the study of physiological disturbances uncomplicated by gross injury of the skeleton or by disease, and throw light upon the prognosis and treatment of these conditions, but because of their conviction that "almost without exception" injuries of the cord and plexus are due to "unphysiological forces imposed upon the fœtus" they hope the obstetrical brethren will be confronted by a problem which it is their duty to meet and solve.

The writers have found that the injuries sustained at birth are apt to be diffuse and unselective, since any part of the system can be involved and in accordance with its anatomical situation rather than its physiological function. Finally they are usually unprogressive. Naturally various established clinical syndromes are often simulated by them, and the etiology in each case has to be proven by the facts that (1) the disability was noted soon after birth; (2) no evidence of such conditions as amyotoma, spina bifida, tumor, infection, etc., are present; (3) the disability was not progressive after the first days of life; (4) evidence that the forces imposed in labor might have produced the supposed injury.

The diagnostic signs upon which the spinal origin of the disturbances were based were largely physiological since the ordinary criteria of specific changes in reflexes and clear-cut sensory disturbances applicable to the adult are obviously not valuable in dealing with infants.

Their thesis is sustained by a series of 28 well-illustrated reports of cases with lesions at various levels and in various combinations. The diffuse and extensive character of the involvement of the cord is indeed surprising and is explained by Crothers and Putnam by the facts that the primitive fœtal tissues are able to survive after extraordinary injuries and that "shock" is also minimized by the absence of gross skeletal and muscular injury. The least favorable cases they consider those with physiological destruction of the lumbar enlargement, where urinary sepsis and trophic ulcers make it difficult to maintain life, to care for the children and to fit apparatus.

The commonest obstetrical manœuver resulting in cord injury is obviously the breech extraction, a manœuver which though frequently unavoidable, should certainly, therefore, not be pressed into use when choice exists.

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